PUBLIC SANITATION

AND

OTHER PAPERS

By

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LOS ANGELES

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*PREFACE

No argument is required to show that health is at the foundation of all happiness and success. It seems that health rests upon a threefold support:

One of these supports is inheritance; it is the right of every child to be well born, this means that the parents must both be free from any transmissible disease.

The new science, Eugenics, is being rapidly developed, and the time is not far distant when the state will no longer give its sanction of marriage to those who are unfitted to become the parents of worthy citizens.

Assuming the child to be born into the world inheriting a good constitution, the second demand for good health is good personal hygiene. By this is meant, such care as the individual must give himself, or such as he must receive from those upon whom he is dependent.

It is obvious that the preparation of food, the arrangement and amount of clothing, the ventilation of private rooms, and the ordinary care of the body, must devolve upon the individual; and it is equally obvious that the wisdom with which the individual discharges these obligations to himself, will very largely determine his health.

The third leg of the tripod is Public Hygiene. No matter how good the constitution may be which one inherits, and no matter how well one may look out for his various personal needs; his health is still dependent upon the purity of his water supply, the cleanliness and purity of his milk, the ventilation of public halls which he may enter, and the proper quarantine of contagious diseases, with which he might otherwise come in contact.

All of these last named subjects belong to the domain of public hygiene. During the last twenty-five years there has been a vast amount of legislation on the subject of public hygiene, and no officers in the United States are entrusted with more arbitrary power than the health officers; and there are no public regulations to which people at large yield more cheerful obedience than they do to the regulations that are made in the real or supposed interests of public health.

This being the case, it means that a great burden of responsibility is thrown upon those who administer the laws for the promotion of public hygiene. It is greatly to the credit of the American people that

*So. Pas. Rec., Sept., 1912.

the great power placed in the hands of health boards and health officers has seldom been abused, and when abuses have occurred they have been due, generally, to a mistaken zeal, rather than to any attempt on the part of the health officer to be tyrannical.

There is danger, however, that the best intentioned health authorities may make serious mistakes, and one of the most serious mistakes which they are in danger of making, is in placing too much stress upon bad conditions and in that way arousing unnecessary and injurious fears on the part of the public.

Teachers long ago learned that it was a mistake to place before students unworthy and improper examples of any kind. It was found that when the wrong is placed before the student, it unduly impresses itself upon his mind, and even if the right was placed close by, he was likely, in future times, to confuse one with the other.

So in teaching public hygiene to the public at large, it is undoubtedly better to place before them good conditions which they are to imitate, rather than place before them evil conditions which they should avoid.

Then there is another factor which is of great, though unmeasured importance, and that is the depressing influence of fear. All thoughtful physicians recognize the fact that immunity from infection is a variable factor and that anything which lowers vitality and impairs the digestion tends to increase the susceptibility to communicable diseases.

Somebody makes Job say, "The evil which I feared hath come upon me" and the expression of Job is largely repeated in life today. Paul was wise when he advised people to think upon the things which were good, pure, etc., as this always tends to strength.

The extent to which even the educated mind is biased by preconceived ideas is shown by the readiness with which trained physicians are wont to recognize cases of a disease which takes a strong hold upon the public mind, even when such a disease does not exist.

One may smile at the readiness with which slight stomach disorders are diagnosed as infantile paralysis, when that disease is expected, and how readily cases which are caused by poison oak become small-pox, when the mind is firmly fixed upon small-pox.

In cases of this kind, it would be grossly unjust to assume a willful deception; they simply illustrate to what a degree we are dominated by preconceived ideas. Cases like these are, of course, unfortunate, as they tend to bring necessary public health measures into disrepute.

PUBLISHER'S NOTE

It is with great pleasure that the useful and accurate papers left by Dr. Clement A. Whiting are thus offered in permanent form to that profession and that public which he so long, so faithfully, so thoughtfully, and so efficiently served.

The small paragraphs are taken from lectures, and from certain longer articles of merely local or temporary interest.

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"It has been said of old 'Ye shall know the truth, and the truth shall make you free,' and we have been thinking of this as referring to big philosophical and theological and poetical things. We are losing sight of a great truth, a powerful agency for good, in thus distorting the words from their original significance. It is the plain, simple, matter-of-fact things that make us free from our most grievous ills; it is the simple and unpretty facts of the transmission of disease that give us the ability to keep free from illness; it is the knowledge of the physiological facts of life that enable us to make the most out of life; it is in the solution of the problems associated with crime and ignorance and in the understanding of things that are often repugnant to every sense of what is beautiful and fine, that we attain freedom from every physical and mental and moral disability. Things are not true just because they are pretty, or just because they fit our preconceived ideas of what truth ought to be; a thing is true because it is a fact, and it is the facts of life, cleanly and clearly appreciated, that make us, in the broadest and finest sense, free."

(Address to Freshman class).

PART I.

Public Sanitation and Personal Hygiene

*INTRODUCTION.

The modern physician occupies a two-fold position. On the one hand he is specifically employed by his patients to render them a special service; on the other hand he is a licensed officer of the state charged with the important duty of aiding in the prevention of and the spreading of contagious diseases. In the discharge of his first duty he must do everything in his power to promote the well being of his patients. In the discharge of his second duty he must remember that however great is his obligation to his patients, his duty to the public is still greater. In the discharge of his public duty he must be the lieutenant of the local health officer, and the more faithfully he co-operates with this official the greater is the public value of the physician.

No right-minded person will ever undertake to minimize the importance of helping those who are sick to recover their health, but it is still more important to keep others from being sick by preventing the spread of disease. The number of people whom any one physician can aid in recovering from disease is very small compared with the number of people whom the physician may aid in protecting from disease. About the first thing which a physician should do when he establishes himself in a new location is to become acquainted with the members of the Board of Health and through the executive officer of the Board to co-operate with them in everything that makes for the general well-being of the city. The physician should immediately inform himself in regard to the health regulations not only of the state, but also of the community in which he expects to practice.

Public sanitation in its broadest sense means very little more than applied bacteriology. This being true, it follows that the physician must be a bacteriologist. It is not very unusual to meet with physicians of all the schools of practice who say that while they studied bacteriology when they were in the medical college they have become rusty since their graduation. Those who permit themselves to do this are, of course, wholly unfit to discharge their duties to the state in an intelligent manner. They are, from a professional standpoint, in somewhat the same position that a business man would be from a business

*Jour. A. O. A., Feb., 1912.

standpoint who had learned to read when he was a schoolboy but who had since forgotten that art.

During the period of our Civil War the world was appalled at the hideous loss of life. During the four years of war the Federal army lost by those directly killed in battle, 110,070 men. It is probable that the loss on the Southern side was equal to this and possibly greater, but if this were true, even if this enormous number had to be doubled, it would still be less than the number of children under two years of age who are reported to have died in the four years between 1903 and 1907, for during that period there were reported the deaths of 271,773 children under two years.

It is impossible to express in words or figures the social and financial loss which comes from such an appalling death rate, and when we know that a large number of these cases are preventable, were proper attention paid to public sanitation, it must be felt that the time is ripe for a vigorous movement toward bettering living conditions. We now know that tuberculosis is a communicable disease. We know that it is a preventable disease. We know that it is a disease from which the patient may readily recover, and yet knowing these things we still suffer a loss of more than 150,000 persons every year from this cause alone. That is, more than four hundred persons die each day from a disease from which they could be protected and from a disease from which they might recover could they be placed under favorable conditions at the proper stage of the disease.

Aside from the social side of the loss, which can neither be represented in words nor figures, the money loss is more than $1,000,000,000 per year. Surely if some Congress should propose to lay a tax of a billion dollars a year upon the people of the United States a protest would arise which would burst open the gates of high heaven, and yet we quietly submit to the infinitely more onerous one imposed by conditions which we can prevent.

One of the important lessons which must be impressed upon us as a people is the fact that early death is absolutely indefensible. From a broad survey of biology it appears that death is absolutely inevitable, but when it comes it should come as physiological death and not as death due to some abnormal condition. It is time that the custom of trying to reconcile people to the death of children should cease, and instead of seeking to impress upon a mourning community that they must reverently bow their heads in humble submission to their loss, we should in fitting language arouse them to a recognition of their duty in preventing further losses of the same kind. Even in the hour of trial and affliction, truth is better than fiction. The parent grieving over the untimely death of a child, the brother mourning the untimely death of his sister, can find no truer consolation than the thought that they may by their efforts aid in preventing others from suffering as they are obliged to suffer.

Insects in the United States cause a monetary loss of more than one billion dollars per year, and it is probable that much fatal sickness may be traced directly or indirectly to this source. This loss of life and loss of property can be abated only by an accurate knowledge of the life history of these pests. It is asserted on good authority that during the Spanish War many more soldiers died from the effect of flies than from the effect of Spanish bullets. Some recent experiments which have been made show that the average fly carries about 1,250,000 bacteria upon the various parts of his body, and when we think of the filth which flies unhesitatingly visit, we need not be surprised to know that many of these bacteria are pathogenic. The few flies which can be killed in traps, by fly paper and other means amount to practically nothing, and measures of this kind will never appreciably reduce their number. It is only by a knowledge of the life history of the fly, by absolutely killing them before they are hatched, that we can reduce the danger from them.

All of this belongs to public hygiene. It is along these lines that the physician must aid in the education of the public. It is not wise to arouse profitless fears, but the physician must know enough of applied biology, and he must be enough of a public hygienist to give accurate information in regard to these important matters. In almost every city steps are being taken to educate the people at large along the lines of public health, and the members of the osteopathic profession should be ready to take a leading part in this great work.

It is for the purpose of awakening an interest along these lines that the *Journal* has introduced a department of Public Sanitation.

If there is any lesson which we need to learn more than another, it is that we live in a world of cause and effect; that from a standpoint of health, at any rate, there is no such thing as vicarious atonement; that disease comes as a result of a violation of the laws of our beings, and that disease can only be prevented by a thorough understanding of the causes of disease and an intelligent avoidance of those things which produce it.

*DISEASE GERMS OUTSIDE OF THE BODY.

From very early times it has been believed that many diseases are due to malarial vapors, or emanations, which were either gaseous or non-gaseous. These vague terms were applied to conditions which were supposed to originate in all kinds of animal and vegetable filth, in swamps and in other noisome places. This line of thought, of course, meant that diseases were traced to conditions outside of the human body and by 1850 a considerable philosophy of disease based upon this theory had been worked out. At this time it was strongly suspected that diseases were due to organisms of some kind which originated outside of the human body and as bacteria were found to be numerous in such places as before named, pathologists were tracing disease to them, and from the belief that disease germs originated and multiplied in filthy places arose the supposed necessity of cleanliness in the interests of public health.

It was twenty-five or thirty years after this time that laboratory methods clearly and positively showed that very few pathogenic organisms increased in number outside of the animal body, and that pathogenic organisms are almost entirely, if not entirely, parasitic in their nature and that consequently they cannot increase outside of the body of their host. I am going to cite a few diseases to show the difference between these theories which are really conflicting, but which do not appear on the surface to be radically different.

It has long been known that tetanus, or lock jaw, results from punctured wounds, and that the danger of tetanus is greatly increased if dirt of any kind is carried into the wound. This not unnaturally led bacteriologists to believe that the bacillus producing tetanus normally lived in the soil and that its introduction into the animal body is simply an unnecessary incident in its life. This belief was strengthened by the observed fact that the bacilli increased in number in cultivated soil. While it is barely possible that the bacillus may reproduce itself outside of the animal body, its increase in numbers in the soil is not positive evidence of this fact. We now know that the bacillus of tetanus is a normal inhabitant of the alimentary canal of the horse. It is reasonably certain that it increases in number in this location by reproduction, and as the excrement of the horse is largely used for fertilizing land, it is easy to see how the bacilli may continue increasing in numbers in the soil without reproducing themselves there. We know that this bacillus

*Jour. A. O. A., May, 1912.

has extraordinary powers of resistance and that it is not easily killed. Moreover, it is one of the spore-producing bacteria and the spores have even greater powers of resistance than have the bacilli. Careful experiments have shown that the spores may retain their vitality outside of any culture medium for at least sixteen years. This being true, it follows that the number of bacteria in any given soil may represent the accumulation of sixteen years or more of time. It seems quite certain that all of the stories which have been told of the infection of the soil may be explained by the hypothesis already given.

Anthrax is another disease which has been traced to the soil and there seems to be some reason for believing that under some conditions the bacillus producing this disease may increase by reproduction in the soil. It is also true that this is a spore-producing bacillus and that both the bacillus and its spores possess remarkable powers of resistance and longevity. In some cases which have been carefully analyzed it has been found that the waste from tanneries, and other places where the hides of animals are used, has been discharged upon the ground and thus the bacilli have been added to the soil by these constant additions, rather than by reproducing themselves. There is at least one recorded case where careful bacteriologists were of the opinion that anthrax bacillus reproduced itself in a pond of water. Admitting that reproduction may occasionally occur outside of the body and that the bacilli produced in either the soil or in water may cause an infection resulting in anthrax, the fact still remains that the danger of contracting the disease directly from the infected animal is very much greater than is the danger of contracting it from infested soil or water.

No disease is more regularly traced to external conditions than is typhoid fever, and yet careful bacteriologists seriously question the extensive increase in numbers of these bacilli outside of the human body. It is known that they may retain their vitality in soil for a considerable length of time, but it is highly improbable that they reproduce in the soil. It is quite well known that sewage which may at first contain large numbers of these organisms soon become free from them. Water may act as a carrier of the typhoid bacilli and they may retain their vitality in it for a considerable length of time, but it is not known that they increase in this medium. The bacillus is not killed even when water is frozen and so they may be carried in ice, but no one has ever suspected their increasing in numbers in the ice. Oysters may become infested with the bacilli, but there is little reason for supposing that they materially increase in number while in contact with this mollusk.

Milk is known to be an excellent culture for the typhoid bacilli and it is very certain that it not infrequently acts as a carrier of them, but it is only when the milk is sterilized and a pure culture of the bacilli is added to the milk that they undergo any great increase by reproduction in this medium. Even if they are present in unsterilized milk, they are soon prevented from increasing their numbers by the products produced in the milk by other bacilli.

These cases already cited, and some which I shall venture to present in a future issue, indicate that the danger of contracting disease by immediate contact with one already afflicted with it is very much greater than is the danger of contracting disease by means of fomites.

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*NIGHT AIR.

There is a strange and absolutely foundationless prejudice on the part of many people against what is commonly called "night air." Take the year through, the sun is below the horizon one-half of the time and, as this constitutes night, it really means that we have to breathe "night air" one-half of each year, if we breathe at all. Many otherwise intelligent people seem to think that if the windows are duly closed that "night air" is shut out. As a matter of fact, the air in the dwellings is as much "night air" as is the air outside of the houses. All that closing the windows does is to obstruct ventilation and thereby permit the air to become utterly unfit for respiratory purposes.

The plain truth is that the prejudice against "night air" has been based upon the fact that people have refused to allow their rooms to be properly ventilated. It is never a good thing either during the night or during the day to allow a draft of air to fall upon any one part of the body and either unduly heat or unduly chill that part. Anything of this kind always tends to destroy a well-balanced circulation and this is always unfortunate. It is much less injurious to allow the whole body to be chilled than to permit a small area of it to be chilled.

No one need fear breathing so-called "night air" in the slightest degree. Bed-rooms should have doors and windows opened wide, and if one can sleep on a porch where there is absolutely no obstruction to the circulation of the air, he is, indeed, fortunate. If one is so unfortunate as to live in a mosquito infected area, these insects should of course be excluded, but health and good sanitation demand an absolutely unlimited supply of pure air.

*West. Ost., Nov., 1918.

*DISEASE GERMS OUTSIDE OF THE BODY.

CONTINUED.

Few subjects are of more importance to the public hygienist than is the question as to how long pathogenic bacteria will live outside of the human body. As one reads the literature of this subject he can only feel that surprisingly little is really known, as the views which are expressed by competent writers are so sadly at variance with each other. The best authorities which I have been able to consult are of the opinion that the bacilli which produce cholera may, under favorable conditions, live about two months in moist earth, but is probable that they do not live so long as this under perfectly natural conditions —indeed, two weeks has in several cases proved to be the limit of time in which it was possible to recover the bacillus from earth which had received no artificial care. In several cases the bacilli have been recovered from the bodies of patients dying from the disease a month after death, and this has been true even when the body has been injected with preservatives. Experiment has shown that they are very short lived in milk, and while they may live for several days in sweet milk, they perish almost immediately in sour milk, and there seems to be very little evidence that they appreciably increase in numbers either in the moist ground or in milk.

In the outbreaks of yellow fever, which occurred in the South some years ago, it was believed that the disease was spread by personal contact and through various kinds of intermediate matter, and at one time whole cities in the South were placed under a quarantine. Further investigation has shown that all the efforts which were once employed to guard against malaria and yellow fever were wholly without effect, as these diseases are now known to be spread almost entirely, if not entirely, by special species of mosquitoes; in other words, it was not the bad air from the swamps which produced the malaria, but the mosquitoes which bred in stagnant water. This one discovery has done more to make possible the Panama Canal than perhaps any other one thing. It is pathetic to read of the precautions which were formerly taken on the Isthmus to protect people from tropical diseases, and to see that almost everything was done that could be done except the one supremely necessary thing; that being to protect people from the bites of mosquitoes and other tropical insects. The history of these

*Jour. A. O. A., Oct., 1912.

diseases teaches us in the most striking manner the impotence of good intention not directed by absolute knowledge.

Tuberculosis, pneumonia, influenza, gonorrhea and syphilis form a striking group of serious diseases where there is reason to believe that the organisms producing them are never naturally increased outside of the human body. It is true that at the present time all of the organisms producing these diseases may be successfully cultivated out side of the human body, but as before stated, there is no reason to believe that they ever increase in nature. The germs producing gonorrhea and syphilis are certainly unable to live for more than a brief period outside of the animal body. The germs producing the other diseases may live somewhat longer, but even they are quickly destroyed if exposed to the light of the sun.

In 1902 and 1903 there was a serious outbreak of cholera in the Philippine Islands. Owing to the almost total lack of sanitation at that time, body wastes of all kinds were promiscuously thrown on the ground, and in whole villages the soil must have been thoroughly permeated with the germs of cholera; nevertheless, the epidemic there was not long lived. Careful examination showed that the rice and other foods sold in the streets contained bacilli of cholera, and there is much good reason for believing that the disease was spread more by the food than by the germs in the ground. No evidence was accumulated that the germs showed any tendency to increase in numbers in the foods just mentioned.

It is not very unusual for typhoid fever and cholera to be associated with each other; when this is the case, there is a marked tendency for the two diseases to increase and decrease together. This leads one to believe that they are both spread in about the same manner, and in both cases there seems to be very much greater danger of infection passing directly from one person to another by contact, than there is of the bacilli being carried by some intermediate object, though the danger of the intermediate object must not be overlooked. It is hard to find any two diseases which have more profoundly affected the history of mankind than yellow fever and malaria. Under various names these diseases have been known from earliest times, and among peoples of almost all nations. Some of the most fertile regions of the earth have been regarded as uninhabitable because of the presence of one or the other, or both of these diseases. Some modern historians suspect that great Persian armies, which at one time invaded Europe, were driven back quite as much by malaria as by the valor of the

Greeks. The very word malaria indicates what was supposed to be its origin, the word meaning "bad air," and so long as this view prevailed it was, of course, impossible to accomplish anything in combating this disease.

The amebic dysentery is now becoming a disease with which we have to reckon. This is especially true on the Pacific Coast, where soldiers and other travelers are constantly returning from the Philippine Islands, where the disease is especially common. As in the case of so many other diseases, there is little reason to believe that the amebae producing this disease multiply to any extent outside of the human body. This ameba will probably live for some time in water, and it may possibly increase in numbers in milk, but the increase for the most part occurs only in the body of the person infected.

There are many bacteria which are especially known as the bacteria of suppuration; the most important of these are the Micrococcus aureus, Micrococcus albus, Micrococcus citreus and Streptococcus pyogenes; these are frequently found in the tonsils and lymphatic glands and in the deeper layers of the skin without producing any appreciable effect. It is possible that to a limited extent these may increase in numbers outside of the body, but the extent to which they increase is undoubtedly very limited.

If the statements contained in this article are true, it means that some of our views in regard to public hygiene have got to be revised. Aside from anthrax and tetanus, and possibly some of the pus-producing organisms, few of the pathogenic bacteria increase in filth, and if this is so, filth as the term is ordinarily used, is somewhat less dangerous than we have been taught to suppose it to be. This certainly should not make us more tolerant of it, because in many ways it must act to lower vitality, and it is certainly offensive to the finer sensibilities; but when we are dealing with diseases it is important to know the truth, and if it is true that the pig-pen and chicken-yard are not as much of a menace to health as we once supposed, our love for the beautiful and the clean will not permit us to more readily tolerate them where they should not be.

The principal reason why a man who is down, remains there, and continues to appear as ordinary as his environment, is because he permits his mind to be impressed with everything his environment may suggest. His thoughts are therefore the reflection of his surroundings, and he is like his thoughts.

*DISEASE BY PERSONAL CONTACT.

It is agreed by all hygienists that personal contact with those who are diseased is one of the most certain means of inducing its spread. This is more clearly recognized in regard to venereal diseases than in other cases of sickness. Indeed, there is a general belief that gonorrhea and syphilis are practically always transmitted by personal contact, and usually in cases of sexual connection. While this may usually be the case, it is certainly not always true.

Intrinsically, there is no reason why gonorrhea, at any rate, may not be transmitted by an intermediate object as readily as scarlet fever, and there is certainly no evidence that the same statement may not truthfully be made of syphilis. Gonorrhea is not only a very common disease among infants, but is one of the most serious with which the physician has to cope. Not only may the infant become infected at the time of birth, but the disease is readily transmitted by the careless nurse in many different ways. Napkins, thermometers, wash rags, nursing bottles, and in fact anything which may pass from one infant to another may be the means of carrying this dread disease.

In many hospitals devoted to the care of infants, vaginitis spreads with alarming rapidity from one female child to another, and in many cases it is hence considered that the bath tub is responsible for this rapid spread of disease. The public towel is certainly an abomination which should be eliminated, as a person suffering from eyes affected by the gonococcus may easily leave the germs upon the towel and thus infect almost any number of people who afterwards might use it. There is good reason for believing that the organism producing syphilis is not so readily transmitted by intermediate objects; it also seems probable that this organism does not live for any length of time outside of the human body. Still, anything used by the syphilitic patient should be regarded with greatest suspicion; and cups, glasses, pipes, toilet articles, and in fact everything used by him should either be thoroughly disinfected before being used by anyone else, or, better still, destroyed.

We have of late years learned so much of the possibility of disease germs being carried by fomites, that there is danger of our overlooking the dangers arising from personal contact. In every department

*Jour. A. O. A., March, 1913.

of life we find ourselves blinded to large numbers of facts by having our attention especially directed to a single thing; seeing that one thing frequently blinds us to everything else. While amebic dysentery is usually contracted through intermediate objects (polluted water and vegetables grown by irrigation), there are some cases recorded where it seems almost certain that the disease has been transmitted by personal contact. An uncleanly mother may easily transmit this disease to her baby by means of unclean fingers. Bacillary dysentery is also readily transmitted by unclean habits associated with the toilet. One interesting case is reported where a physician acquired this disease from first having infected his eye. Tears ran copiously from the infected eye, and some of these were swallowed, thereby conveying the bacilli to the alimentary tract.

The careful study which cholera has received in recent years has convinced close observers that much of the cholera prevalent in the Orient is closely associated with the uncleanly habits of the people. Dirt and disease not only begin with the same letter, but more and more we are impressed with their close association and relationship to each other. "Dirt" is derived from the old Anglo-Saxon word "drit," and in its primitive meaning, this meant excrement, and in my statement in regard to dirt and disease I use the word in its original significance. In spite of all the work which has been in the line of popular education and in spite of the extent of our knowledge in regard to typhoid fever, we still have in the United States nearly two hundred thousand cases each year. At least 3 per cent. of these cases become "carriers" for a period of at least three years. This means a constant population in the United States of eighteen thousand well people who are in danger of transmitting typhoid fever to those with whom they are associated, and when 25 per cent. of those recovering from the disease who are at least temporary carriers shall be added to this number, it is easy to see that those capable of transmitting typhoid fever are by no means few. No one should undertake to minimize the danger from contaminated water, milk or vegetables, and while no one should underestimate the danger arising from the filthy housefly, these things should not blind us to the dangers arising from personal contact. The following quotation from Dr. Sedgewich pretty well illustrates the whole matter, and I believe the inferences to be drawn from this quotation are in little danger of being exaggerated. In speaking of a certain city, he says:

"Children abound; and as there are no fences, and because it is the custom, they mingle freely, playing together and passing from house to house. The families are of that grade in which food always stands upon the table; meals are irregular except for those who must obey the factory bell. The children play awhile, then visit the privies, and with unwashed hands, finger the food upon the table. Then they eat awhile and return to play. Or, changing the order of things, they play in the dirt and eat and run to the privy, then eat, play and eat again, and this in various houses and in various privies. For them, so long as they are friendly, all things are common—dirt, dinners and privies; and, to illustrate exactly how secondary infection may go on, I may describe in detail one case which I personally witnessed: A whole family (of six or more) was in one room. Four of them had the 'fever.' Two of these were children in the prodromal stage. A table stood by the window covered with food, prominent among which was a big piece of cake. It was early September, and a very warm day; but every window was shut and the odor sickening. Flies innumerable buzzed about, resting now on the sick people, now on the food. A kind-hearted neighbor was tending the baby. By and by one of the children having the fever withdrew to the privy, probably suffering with diarrhea, but soon returning, slouched over the food, drove away some of the flies, and fingered the cake listlessly, finally breaking off a piece, but not eating it. Stirred by this example, another child slid from his seat in a half-stupid way, moved to the table, and, taking the same cake in both hands, bit off a piece and swallowed it. The first boy had not washed his hands and if the second boy suffered from secondary infection, I could not wonder at it.

"This was one case; but I have seen so often the table of food standing hours long in the kitchen, and serving as one station in the dirty round of lives like these, that it is easy for me to understand how dirt, diarrhea and dinner too often get sadly confused. The privies had been obviously in bad condition, and, from some, filthy streams ran down between them and the houses. In and around these streams the children played. Given any original imported case, the infection might easily have reached these trickling streams. Children's fingers might thence carry the germs to the food, and thus the journey of the germs from one living intestine to another be completed. Or, again, given in such a community, an imported case and no disinfection, as was the condition here at first. The importer, while in the early stages, handles with unclean hands food for others; or the clothing of such a person gets infected and is handled; there need be, then, no difficulty in completing the history. It follows as a matter of course."

One reason why the danger of contact infection has been disregarded is because typhoid fever has been looked upon as a purely intestinal disease. There is now good reason for believing that there may be many cases of typhoid fever in which the intestinal tract is not seriously involved. Typhoid fever appears frequently to be a general infection of the body, and it is highly probable that the bacilli gain their entrance to the blood through the throat and the upper portions of the alimentary canal.

Even a very superficial reader cannot help being impressed with the remarkably chaotic state of modern medical science (so-called). We pick up one health journal and we are gravely told of the ease with which the most inexperienced mother can safely pick out the drug most befitting the ills from which her child is suffering. We pick up another, and we are told that while drugs may be good, they must only be used by the most experienced physicians. The drug that is recommended by one is denounced as a vile poison by another. When we read these contradictory opinions, we feel like paraphrasing the old prophet, who, when disgusted with the numerous plans men had devised to please their god, raised the question: "What more doth the Lord require of a man than that he shall deal justly, love mercy and walk humbly with his God?" and so we are ready to inquire what more it is possible to do to restore health or keep health than to intelligently conform to the laws of our being, and by this we mean, to live in a proper environment internally and externally, eat simple food and eat in moderation, sleep in well-ventilated rooms, keep ourselves free from the debilitating passions of envy, malice, spite and jealousy, and to feel that we indeed have a work which no other can do and that we must do it both for our own welfare and for the welfare of the world. He who lives in this way will not have much time or much need for disputing over the merits or demerits of drugs.

*THE SPREAD OF DISEASE BY CARRIERS.

One of the most important discoveries of recent times along the line of public hygiene is the discovery of the fact that a person may carry upon his person, or within his person, pathogenic bacteria, without himself suffering at all from the disease which they are capable of producing. The discovery of this fact was made a good many years ago, but its full significance was not understood until comparatively recently. The person capable of carrying these organisms is now popularly known as a "carrier," and recent investigations have shown that these so-called carriers may be the means of disseminating a large number of different kinds of pathogenic bacteria.

Meningitis.—The disease known as cerebrospinal meningitis has been recognized as a distinct disease for many years, and it has been known for twenty years or more that one of the more virulent forms of this disease is produced by a bacterium known as the micrococcus meningitidis, but until recently it has not been known how this organism is passed from one person to another. Recent investigations have shown that when one suffers from this disease these organisms are abundant in the nasal secretion, and there are at least three ways in which the organism may be introduced into the meningeal membranes. One way is undoubtedly from the nostrils through the cribriform portion of the ethmoid bone; another means is through the tonsils into the general circulation; and still another means is by the organism being swallowed and passing from the alimentary canal into the general circulation. There are so many cases in which the organism has been recovered from the blood that it seems reasonably certain that infection is very frequently through one or the other or both of the last two mentioned ways. There are many cases in which the micrococcus is found in the nasal secretions, without a person showing any indications whatever of the disease, and in many cases which have been carefully watched, the person thus harboring the organisms never develops the disease; in many other cases the organism seems to cause a more or less severe rhinitis or pharyngitis. A German bacteriologist —Keifer—suffered from a severe attack of rhinitis, which was traced directly to an infection by the micrococcus meningitidis, with which he was at the time working.

A few years ago there was a violent outbreak of meningitis in the

*Jour. A. O. A., Nov., 1912.

city of Bonn. Careful bacteriological examinations showed that out of 173 fathers of families, who were examined, 60 were carriers of the micrococcus, although they had no symptoms of the disease; out of 153 mothers, who were examined, 39 were found to be carriers; and out of 478 children examined, 118 were carriers, although none of them ever developed any of the symptoms of meningitis. The worst of the matter is that the carriers may continue as such for months at a time, and no means have yet been discovered whereby the organisms may successfully be eradicated from the system. Almost always if not quite without exception, carriers are those who have been in close communication with the sick. The greater the number of cases of the disease in a community, the greater is the number of carriers. Carriers are especially dangerous in spreading disease, as it is comparatively seldom that they are recognized as being carriers, and when they are, it so often happens that their entire freedom from any indication of disease makes it practically impossible to place them under restraint.

Our modern knowledge of carriers enables us to understand why it is that it so often happens that the disease breaks out in a house after a most thorough disinfection. Recent studies which have been made of meningitis seem to indicate that those who have the disease may almost be regarded as the victims of accident, as the number suffering from the disease always appears to be small compared with the number who carry the micrococcus without ever developing any of the symptoms of meningitis. Incidentally it may not be without interest to mention that the micrococcus is almost specific to the meningeal membranes, as these never become infected without producing serious results, whereas the infection of other parts of the body is far from producing specific results. The number of carriers of the pneumococcus is undoubtedly vastly greater than the number of carriers of the meningococcus.

Diphtheria.—In 1884 Loeffler first recognized the fact that a person may carry in his respiratory passages the bacillus diphtheriae without suffering from diphtheria. In an outbreak of diphtheria in Glasgow, Scotland, a few years ago, it was found that nearly ten per cent. of those who came in contact with patients suffering with diphtheria became carriers, although the number who developed the clinical symptoms of the disease was comparatively small. Another thing which complicates diphtheria is the fact that so many scarlet fever patients also have diphtheria, and the child who has recovered from scarlet fever, and has been allowed to return to school, may be a menace because of his being a "carrier" of diphtheria.

Dr. Jacobi, of New York, was one of the first to recognize the great number of atypical cases of diphtheria. He was one of the first to call attention to a mild type of diphtheria, in which the diagnosis of the condition is extremely difficult. More than twenty-five years ago he said of this disease: "The symptoms are often few—a little muscular pain and difficult deglutition are perhaps all that is complained of. Women will quietly bear it; men will go to their business. There is as much bacteria out of the body as in the body, and nearly as much out of doors as in doors. Many a mild case is walking the streets for weeks without caring or thinking that some of his victims have been wept over before he was quite well himself. Diphtheria is contagious. Severe forms may beget severe forms, or mild forms; a mild case may beget mild or severe cases." Both rhinitis and otitis may be due to diphtheretic infection, and as these are frequently not regarded as true cases of diphtheria, such patients may readily become a menace to all around them.

Typhoid Fever.—There are few who have read recent medical literature to any extent who have not heard of "Typhoid Mary." While this woman is in the enjoyment of continued good health, experience has shown that she is a menace to any family of which she becomes a member; in other words she is a continual "carrier" of the bacillus typhosis. Were she the only carrier of this organism, the case would not be as bad as it is when we know that large numbers of people are carriers, and that most of them are entirely unsuspected as being such.

Really the only way for people to protect themselves against typhoid fever is for every member of a family to act as he would act if he knew that he was constantly infected with the germs of this disease. When a "carrier" follows any occupation which makes it necessary for him to handle human food, he becomes particularly dangerous. A careless milkman, who is a "carrier," may be the means of spreading typhoid fever far and wide.

Tuberculosis.—It has long been known that persons may be tubercular without seriously suffering from the effects of their infection, but in many cases, while the patient may not suffer he is at the same time capable of communicating disease to others, and if his habits are at all careless, he thus becomes more or less of a menace to those with whom he is associated. If there is the slightest reason for suspecting that one may have latent tubercular infection there is every reason for expecting him, and even requiring him, to act with the great care which should characterize one who is the known victim of this disease.

Gonorrhea.—Few diseases are more terrible in their ultimate consequence than gonorrhea. This is especially true when the victim is a female. In the male there is a marked tendency for the disease to ultimately lose its acute character and assume either a chronic form or become absolutely latent. When it assumes the latter condition, not only the patient himself, but his physician frequently supposes him to be free from the disease, and so far as he is personally concerned he may some times be regarded as being in this condition; but the tragic fact is that when the disease is latent in the patient, it may still be easily communicated to some unsuspecting victim, and in this way a life may be completely wrecked. There are many vaunted "cures" for gonorrhea, and some of these unquestionably leave a patient in a much better condition than he was before he was treated, but until we shall know more than we now know of the ultimate effect of this treatment, everyone who has ever had this disease should be regarded as a "carrier" and treated as such. If this were done and if the conscience of the patient himself could be properly developed, it would save a greater amount of suffering than can be imagined by anyone who has not had an opportunity to attend a gynecological clinic in some of the large cities.

Summary.—I will sum up this article on "infection by contact" by saying that the danger of adults contracting disease from each other by contact is much less than is the danger of children contracting disease by contact, and that while reasonable precaution should be used by people to avoid becoming carriers, a still greater precaution should be used by known "carriers" not to communicate disease. It is probable that we are fully justified in the complete separation of the child "carrier" from his schoolmates, for in the close contact of the school room, and with ventilation as imperfect as it frequently is, and with the lowered vitality consequent upon this imperfect ventilation, it is very easy for disease to be communicated from one child to another.

When we come to a standstill we are in danger of assuming that the world is doing the same, but this is not true. We can keep up with the general progress only by constant activity.

*CLEANLINESS AND ISOLATION.

In following out the line of thought presented in last month's issue, it seems proper to refer to the dangers arising from the hookworm. This worm has long been recognized in many parts of Europe as a dangerous parasite, but it is only in recent years that we have become cognizant of its presence in the United States. There seems to be much good reason for believing that the inefficiency of the so-called "poor whites" of the South is largely due to the presence of this worm. It is found throughout the small intestine of those people who are unfortunate enough to harbor it, and it gains entrance to the human body in a rather roundabout way.

The worm itself (Anchylostoma duodenalis) is a nematode worm about one-half inch in length. Its numerous eggs are discharged in the contents of the alimentary canal, and unless fecal matter from the patient is taken care of by a deep vault, cess pool or sewer, the worms are likely to get into the damp ground over which fecal matter may be scattered. When the ground is at all damp, these worms keep near the surface, and if there is a possibility of their entering the human body through bare feet or through other parts coming in close contact with the ground, they do so. It is easy to see how half-naked children, playing upon soil infected with these worms, may become their victims. It has long been known in the South that children playing under these conditions were subjected to a skin eruption which was known under various names — "ground itch" and "dew itch" being two terms which were quite widely applied to this condition. This skin eruption is now known to be due to these minute worms burrowing through the skin, and in this way they ultimately enter the blood vessels. When they are carried to the lungs, they leave the blood vessels and enter the air spaces. From here they make their way through the trachea to the pharynx. Here they are swallowed and quickly passed through the stomach, reaching their permanent home in the small intestine.

With the life history of these worms before us, the problem of preventing their entrance into the human body is comparatively simple. Like most other preventive measures, it simply means cleanliness, written in big letters. It means that all excrement from the human body is dangerous and that it must be disposed of in such a way as to not contaminate the general surface of the ground. It means a

*Jour. A. O. A., April, 1918.

satisfactory closet and cesspool, where sewers are not practicable. The small cost of satisfactory appliances amounts to very little, when compared with the sickness and inefficiency which results from a lack of these things. It is an old proverb that "poor people have poor ways," and it is a profound truth that poor ways often make poor people. Nowhere is this truth brought more clearly to our minds than in the hookworm section of our country. It is uncertain how far north the hookworm may live, but it is quite probable that, with imperfect sanitation, its range may be greatly extended.

One does not require a very deep experience in life in order to recognize the fact that we are all, to a greater or less extent, the victims of self-hypnotization. In other words, when we become possessed of one idea that seems to effectually shut out the possibility of other lines of thought. We of this generation have become thoroughly imbued with a sense of the dangers from air-borne diseases, and it is difficult for us to realize that there are other means by which disease may be transmitted, and that these other means may be as important, or even more important, than the air. People who refuse to walk on the same side of the street as that on which there is a smallpox patient, or who will go a block to avoid passing on even the opposite side of the street, seem to have little fear of drinking from a public cup which may have been recently used by a patient suffering from smallpox or from even a more serious disorder. People, upon the whole, are not cleanly, and this applies in some degree even to those who intend to be extremely cleanly. With the exception of private dwellings and the higher grade of hotels, toilet rooms are, as a general thing, extremely unclean. Fingers, food and feces are not a pleasant combination to contemplate, and yet a careful bacteriological examination shows that they are by no means a rare combination. It is probable that the presence of fecal matter is faithfully indicated by the colon bacillus, and there are comparatively few places in the ordinary toilet room from which this bacillus cannot be secured. It is very certain that a considerable number of the bacteria producing communicable diseases are found in fecal matter. Fingers are a common means for the wide spread of saliva, and in the saliva of the sick the bacteria of disease may frequently be found. The fingers of the cook, the waiter, the milkman, the street-car conductor, and the book reader, pass rapidly from the mouth to the various objects handled. In this way saliva becomes almost universally present, and so is, of course, always ready to be transmitted to the mouth and the skin of anyone using his fingers.

Even if it is true that most of the pathogenic bacteria die quickly, a fresh supply of saliva is almost universally present, containing those which retain their vitality for at least a few hours. Unless the cook is unusually cleanly and unusually conscientious, his fingers pass quickly from his mouth to the articles of food which he is preparing. The waiter, from the usually uncleanly toilet of the ordinary restaurant, is soon distributing food, which he handles with his fingers, to the general public. If the waiter picks up a glass to refill it with water, he not infrequently puts one or more of his fingers inside of the glass. The book reader not infrequently moistens his fingers to aid him in turning over the pages of the book which he reads. In doing this, he conveys the saliva of the last reader to his own mouth and leaves a supply in the book for the next reader. The hands of the milkman are almost certain to come into close contact with the milk. Certainly, in many cases bacteria in this way must be transmitted to the milk. Until very recently the public drinking cup was common on the cars, in the hotel and in the school. A careful worker recently found 20,000 epithelium cells, probably from the mouth, in one cup which was in use in a public school building.

Children, as a general thing, are entirely devoid of any sense of cleanliness, and it is a rather significant fact that children's diseases are most common among children before the sense of cleanliness has developed. Babies, as a general thing, are not brought into very close contact with each other, and it is well known that they are not nearly so subject to the diseases of childhood as are children between the ages of two and ten years. Before the age of two years, they do not come in close contact with each other, and by the age of ten, some ideas in regard to cleanliness begin to show development, but between the ages named, apples, pencils, strings, and toys of all kinds, are regarded as absolutely common property, and it is between these ages that children's diseases are most readily transmitted.

It seems that diseases are not spread so readily in hotels and lodging houses as might be anticipated. I have just had a little personal experience which strikingly illustrates the fact. Several children afflicted with measles recently came to a hotel over which I had jurisdiction as a health officer. The children were at once isolated in their rooms, and although they were separated from several hundred guests only by partitions, and although nurses of necessity passed in and out of the rooms to a limited extent, the disease was not communicated to any other person in the house. If this is true of a disease as easily communicated as measles, there is no reason for supposing that other diseases may not be as certainly restricted. Statistics show that in Providence, R. I., of 4,306 families living in houses occupied in common with other families, scarlet fever was communicated from one family to another in only 295 cases—that is, 6.8 per cent. were transmitted to others, although the families to some extent used common toilets and bathrooms. In the same city, statistics show that 3,667 families living under the same conditions suffered from diphtheria, but the disease was communicated to other families in only 263 instances—that is, 7.2 per cent. of the families transmitted the disease to others with whom they were so closely associated. Statistics of this kind should not serve to make us careless in using every precaution which can be used to prevent the spread of disease, but these statistics should serve to keep us from being hysterical when we are brought into close contact with those who are suffering from communicable disease.

There are a few rules in regard to personal habits which should be impressed upon every child early in life. It is probable that others might profitably be added to this list, but I am venturing to present the following:

1. If necessary to spit, always spit on the ground;

2. Keep fingers out of the mouth;

3. Use handkerchief for all nasal secretions. Never wipe the nose on the hand or the sleeve;

4. Never put pencils in the mouth or wet them at the lips;

5. Never hold money in the mouth;

6. Never hold pins in the mouth;

7. Never exchange half-eaten food of any kind, nor toys which are placed in the mouth;

8. Never breathe or cough in any person's face;

9. Wash hands carefully before eating any kind of food.

It should always be remembered that there is no such thing as a "cure" in the whole world. No matter what the condition of a patient may be, if he recovers from disease he must always recover from forces inherent in his body, and not from extraneous matter introduced from the outside.

*INFECTION FROM FOMITES.

In previous papers we have strongly insisted upon the readiness with which many diseases are communicated by personal contact, and we have expressed doubt in regard to disease being readily transmitted by fomites or intermediate objects. By personal contact is not necessarily meant one person touching another, but a cup upon whose rim there is fresh saliva, a book which is immediately passed from one person to another, a napkin which is moist from the mouth of one person when used by another, are all, from a practical standpoint, necessarily or quite identical with personal contact. Any of these things allowed to stand for any considerable length of time become fomites. Those toys which are gathered from families where there have been cases of communicable disease, and carried to other families in a distant part of the city, or carried to another city, act as fomites. The same thing is true in regard to blankets and books, hides of animals shipped from one place to another, etc.

Years ago, the evidence that disease was widely communicated by these things seemed so conclusive that one would hardly care to question its possibility, and yet we know that many of those views were wholly erroneous. In a number of cases, it seemed very certain that material brought in from Cuba communicated yellow fever to the inhabitants of southern cities, and yet at the present time there seems to be good reason for believing that the disease is communicated almost, if not quite entirely, by mosquitoes. The same ship in which blankets or food stuffs were brought in undoubtedly afforded passage to the mosquitoes which were wholly unobserved, but which really constituted the sole factor for the communication of the disease. The belief in the transmission of disease by fomites is by no means modern. If one will take the trouble to read the 47th to 59th verses in the 13th chapter of Leviticus, he will find a detailed account of the methods to be pursued in preventing the spread of leprosy by means of linen and woolen garments. The methods described here are not in strict harmony with our present views, but at the time this account was written, it is evident that people had some practical acquaintance with what we consider the modern science of bacteriology.

In 1908, Dr. Butler, in an English journal, told at some length of a parlor maid living in a hospital, who for some months came in daily contact with nurses having charge of scarlet fever patients, with-

*Jour. A. O. A., June, 1913.

out contracting the disease, but who quickly contracted the disease when she came into direct contact with a person suffering from it. Of course, isolated cases of this kind prove nothing, but the fact that physicians in most communities observe little precaution in passing from acute cases to others, and the fact that there is seldom reason for believing that they communicate disease, leads me to suspect that infection by fomites is much less common than is generally supposed. I have recently had personal experience with a somewhat widespread epidemic of measles. In a number of cases, bed clothing from the beds occupied by patients was sent to the laundry without having been sterilized in any way. Not unnaturally, I was considerably troubled, fearing that it might lead to an outbreak of measles among the employees of the laundry, but to my relief, not one case developed. Tuberculosis among laundry workers is by no means rare, but it is by no means certain that these cases come from direct infection from clothing sent to the laundry. It would hardly do to jump to the conclusion, from what has been said, that disease may not be communicated by fomites, or that all precautions should be dropped, but our common, every-day experience, when carefully analyzed, is quite enough to lead sensible people to do away with hysterical fear of this kind of infection. While I believe that the danger from rooms in which diseased people have lived is very small, it would not lead me to be any less careful in regard to fumigation, for when every possible precaution is taken, experience still shows that disease is readily transmitted. There is a tenement house district in New York City which has acquired the name of "the lung block." It has derived this name from the fact that a large percentage of its inhabitants are tubercular. The health authorities of New York City have certainly exercised every possible care so far as fumigation and ordinary sanitary precautions are concerned, to prevent the spread of disease in this region, and yet the percentage of tubercular people is not appreciably diminished. The explanation appears to me to be that the disease is communicated largely from one person directly to another. Of course, if it were not for the fumigation and other precautions which are taken, it is not improbable that a much larger percentage of people might be affected. Numerous outbreaks of small-pox in paper mills have been attributed to the rags from which the paper was made, but when one comes to carefully analyze these cases, it is certainly evident that there are other ways in which the disease might have been acquired. There was at one time great fear that rugs brought from the Orient might be the means of introducing cholera and bubonic plague into this country and Europe, but so far as the best health authorities know, there is no case where the disease has been introduced in this way. We are from time to time treated to a scare in regard to the danger of money being a carrier of disease, but there is no evidence to show that clerks and other employees in our large banks suffer more frequently from infectious diseases than do those engaged in other kinds of employment. It must be writ large by the public hygienist that *persons, and not things, are dangerous.*

It is very certain that tetanus is readily transmitted by fomites. The bacillus of tetanus is an unusually resistant form. Careful workers report that it may be in boiling water for an hour without being destroyed. The spores of anthrax are also highly resistant. In fact, there is a close relationship between the danger of spreading disease by fomites and spore bearing bacteria, diseases due to spore bearing bacteria being much more likely to be communicated. Pathogenic bacteria which do not produce spores are usually soon destroyed by drying and sunlight, although diphtheria is somewhat of an exception to this rule, as it is reported that these have been kept alive when dry for a period of five months.

In conclusion, let me say that there is danger that the popular mind is now so firmly fixed upon the dangerous character of fomites that we are somewhat blind to other and perhaps more dangerous methods of communicating disease. If a person communicates disease to those with whom he comes in contact, it is quite likely that he does this because he is a "carrier," as because his hair or clothing are infected.

The "times which try men's souls" are times when real men are made, for it is then that men may act; and no manhood of any value ever was or ever can be developed without action and without responsibility.

No person who loves progress fears investigation; there is no person who is a tyrant who does not fear it.

*INFECTIONS THROUGH THE AIR.

It was commonly believed in the days immediately following the discovery of the relationship between bacteria and diseases, that the breath was a prolific source of infection and that many, if not all, of the germ diseases were readily communicated by means of the air. Scare pictures of various kinds were devised to impress upon people the way in which disease might be communicated. The tubercular person was often represented as breathing out of his mouth an innumerable host of dangerous and malicious looking bacteria. Pictures of this kind are certainly the result of a most vivid imagination, for it is very certain that in ordinary breathing it is practically impossible for bacteria to leave the respiratory tract. Of course, in coughing, it is not unlikely that bacteria will be ejected on and in the particles of phlegm which may be expelled in the air.

Malaria and yellow fever were both long believed to be air-borne diseases. This guess was a shrewd one, although the guessers were entirely wrong in regard to the special way in which the disease is carried. One is often interested and even amused to see how nearly people in the past have come to facts without after all getting a real glimpse of them. The medieval astronomer, who conceived of the earth as being carried around the sun in the hand of some mighty angel, came very near guessing at the law of gravitation, and yet he was immeasurably separated from the real truth. Evolution as taught by Greek philosophers in many respects closely approximates our ideas of today, and yet the underlying principles of the two systems of philosophy are as diverse as are the poles. As a matter of fact malaria and yellow fever are both air-borne diseases, but they are borne by the air because the air permits the passage of mosquitoes, by means of which these diseases are spread, and there is not the slightest reason for believing that these diseases are ever spread in any other way.

It was long believed that smallpox was borne by the air, and in English cities, as well as in American cities, it was observed that smallpox hospitals were frequently a center from which this disease radiated. In fact some physicians who loved statistics undertook to establish a ratio between the number of patients having the disease and the distance at which the hospital infected the air. The only trouble with the mathematical formula which was deduced was that it did not work. Later and more careful observations show that there is little real dan-

*Jour. A. O. A., July, 1918.

ger of smallpox spreading through the air. Like so many other diseases, it is usually spread by personal contact. If it were a true air-borne disease, people living within the area which might be affected by a hospital should all be afflicted about the same time, but as a matter of fact those who were nearest the hospital are affected first, probably because they come in contact with the patients. The disease which they acquire in this way is readily transmitted to their neighbors, and so the circle grows. As air conditions are more carefully studied, it was found that the prevailing direction of the wind exercised no influence whatever upon the direction in which the disease spreads. Certainly, if it were an air-borne disease, this would not be true. Statistics also show that the males are much more affected by this disease than are females. This is easily explained when we know that men are out, coming in contact with their fellows to a much greater extent than are women.

An old idea, and one which dies hard, is that diphtheria and typhoid fever are filth diseases. Certainly I should not want to appear as the defender of filth and yet the fact remains that no one has yet been successful in tracing either of these diseases to what is commonly denominated as filth. By uncleanly living, poor sanitation, the resistance to these diseases may be greatly lowered and in that way people may be predisposed to them, but the germs of these diseases are vastly more likely to be communicated by close personal contact than in any other way. It not infrequently happens that patients suffering from these diseases may be in the same ward with those who do not have these diseases and yet if they have different nurses, in many cases, the diseases are not communicated.

Infantile diarrhea appears to be an air-borne disease, but in reality the disease is communicated much more by bacteria which are on particles of dust than it is by bacteria which are absolutely free in the air. Poliomyelitis created something of a scare in California during the summer of 1912, and all known precautions were taken to prevent the spread of this disease. Probably three cases out of five which were reported never existed, but there probably were a few genuine cases. It is still uncertain as to how the disease is spread, but much careful work which was done led physicians to believe that it is spread by means of a fly. The stable fly is not unlikely the offending insect.

There is a possibility that both measles and scarlet fever are spread through the air, but when one remembers that these diseases are pre-eminently the diseases of children and that children come in extremely close contact with each other and that both of these diseases are readily communicated before the symptoms are very pronounced, it is not difficult to see that personal contact may be responsible in a vast majority of the cases in which this disease is spread.

Experiments in regard to tuberculosis are conflicting, but it seems almost certain that this disease is communicated, not only by the droplets of sputum which may be expelled into the air, but also by dust which has been previously infected by sputum. The bacilli on dust may retain their vitality for a long time when shut away from the sunlight and fresh air. In museums, where living animals are kept, it has been demonstrated over and again that those kept near the floor are much more likely to contract tuberculosis than are those kept in cages near the top of the room. This is easily accounted for on the supposition that those near the floor inhale more dust than those that are higher. Experiences of this kind simply show that infectious diseases may be transmitted by fomites, but it does not disprove the thought that contagious diseases are in the main communicated by personal contact rather than by intermediate objects.

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*THE COST OF CRIME.

There are few taxes which society is obliged to pay which are so heavy and so grievous as the tax we pay for crime. Although the criminal has probably existed through all ages, there is really no good reason why he should continue to exist in the future. The various societies devoted to eugenics are teaching us that it is possible, with proper care, to breed better men and women. If this is possible it certainly should receive attention. No stock raiser thinks of perpetuating a herd of undersized and imperfectly developed cattle and we must learn that it is just as serious a mistake for society to permit the degenerates to furnish a part of the generation which is to be. We who are living today are only life tenants on the earth and it is clearly our duty to pass the world on to the next generation in a somewhat better condition than we found it. If future generations are to be improved a great deal is going to devolve upon the physician and we earnestly hope that members of our branch of the profession will give this important subject the attention to which its importance entitles it.

*West. Ost., Jan., 1912.

*FAILURE OF ISOLATION IN CONTAGIOUS DISEASES.

There seems to be the best of reasons for believing that pathogenic bacteria do not develop to any marked extent outside of the animal body. A few of them are unquestionably saprophytes, but most of them, as before stated, are strictly parasitic in their habits. This being true the question naturally arises as to how it is that diseases become so widely spread, and how is it and why is it that isolation frequently seems to accomplish so little in checking their devastations. The answer is probably to be found in the numerous mild atypical cases of disease which are now unrecognized, and which until recently were entirely unsuspected. Mild cases of diphtheria are by no means rare, and there are many cases of scarlet fever which are never recognized. The same may probably be said of small pox and of many other diseases. This being true it is evident that early and accurate diagnosis is a factor of great importance in preventing the spread of disease.

While the bacteria from "carriers" may not be quite so dangerous as are the bacteria from more virulent cases, still the unrecognized "carrier" must always be a source of serious danger, and it helps us to understand why it is so difficult to "stamp out" disease. It was not many years ago that many public health officers believed that the end of many diseases was clearly in sight; that when laws should be a little more rigid and a little more easy to enforce, isolation would completely solve the public health problem. Work which was not to be accomplished by isolation was certainly to be accomplished by the destruction of fomites, and by thorough fumigation. The time came when laws were more strict and when it was easier to enforce them and still many diseases continued to spread very much as they spread before the legal machinery was quite so much in the hands of the health officer.

We are certainly not ready to pronounce isolation a failure, but no one can have very much to do with public sanitation without becoming convinced that in spite of rigid isolation diphtheria, meningitis and small pox spread in most unsuspected ways. In the light of modern knowledge three courses are possible in regard to isolation: The first is to do absolutely nothing; this is probably not wise and would not be tolerated by public opinion in any American city. The second is absolute isolation not only of every person suffering from disease, but

*Jour. A. O. A., Feb., 1913.

of every one who can in any way act as a "carrier;" the second course would be as difficult to enforce as would be the first. While public opinion and probably the best sanitarians would not sanction the first course, public opinion would certainly not permit the second, and so no matter what his private views may be the health officer is forced into a course intermediate between the two; in other words, it is possible for him to secure the isolation of those who are manifestly sick with a contageous disease, but it is not always so easy for him to hold these people in isolation as long as the real safety of the public demands. It often happens that the bacilli of diphtheria persist in throats of patients for weeks and even months after he has fully recovered from the disease. During all of this time he may act as a "carrier" of the disease and may cause its wide dissemination. Public opinion will sustain health officers in the isolation of patients so long as they are manifestly suffering from the disease, but few courts, if it came to actual trial, would sustain the health officer in holding the patient in isolation simply because there are some microscopic organisms found lurking in his throat. The same may be said of scarlet fever. So long as the patient is sick it is easy to keep him in isolation, but when the acute form of the disease has given place to a slight discharge from the ear, which does not seem to incapacitate the patient from any kind of work, neither the courts nor public opinion will take very kindly to his being shut up and subjected to all of the inconveniences of a rigid quarantine.

The value of hospitals in preventing the spread of contageous disease is of more importance than is generally understood, but unfortunately the class of people who would be benefited most by hospital privileges, and the people who are most in danger of spreading disease, are the ones who for financial reasons are less likely to go. There is little difficulty in sufficiently isolating wealthy patients to prevent their being a menace to others, but it is often impossible in a poor family to keep the sick member away from others to such an extent as to safeguard the well members of the family, and when these contract disease they of course immediately become a menace to all with whom they come in contact. There is no preacher in the land who proclaims the Brotherhood of Man with such force as does the public hygienist. The poorest, the meanest and the most unimportant member of the community may readily become the means of disseminating disease among the richest and best, when he is not properly cared for. Woe to the community that fails to look after the welfare of its poorest members! While isolation may not be as important as we once supposed it to be, it should be vigorously practiced among school children, particularly from the fact that children come into such extremely close contact with each other, and particularly from the fact that isolation can here be accomplished without working serious hardships upon those under quarantine.

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*THE HOUSE FLY.

The time is close at hand when we must decide whether we are to have our usual quota of summer flies, or whether we shall be free from them. The choice lies with us.

Flies seldom travel more than a quarter of a mile from the place where they are hatched, and they are invariably hatched in filth. The favorite place for the fly to lay her eggs is in horse manure, but in the absence of this, eggs may be laid in any mass of decomposing organic matter. Each fly lays about a hundred eggs at a time, and the batches are laid in rapid succession. The eggs hatch into small white maggots, six or seven hours after they are laid. They live in the maggot form for five or six days, when they pass into the pupae state. The pupae continue as pupae for about five days, when the shell bursts, when they emerge as full grown flies. In other words, in ordinary warm weather flies pass from the egg state to the mature form in about ten days. Any heap of decaying organic matter which is more than six days old is a fit breeding place for flies. I fix the limit at six days, as the pupae are found at the extreme bottom of the decaying mass, and may be left on the ground, even after a very thorough clean-up.

If the people in our city care to be particularly clean in regard to their yards and to have all manure and rubbish of every kind removed at intervals not exceeding one week, we can keep our town absolutely free from these dangerous pests. On the other hand, one unclean place may become a center from which flies will radiate in every direction. A movement in the line of a flyless town must necessarily be supported by the public opinion of the people at large. Would it not be worth while for us all to unite to secure this end?

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*So. Pas. Rec., Mar., 1913.

*DIPTEROUS INSECTS—FLIES.

The house fly, or as Dr. Howard prefers to call it, the typhoid-fly, belongs to the order Diptera. This order of insects is especially distinguished by their possessing two wings. A few of the more primitive members of this order are altogether wingless or lose their wings at an early stage of their development.

The order Diptera contains more than fifty thousand species of insects, and at least seven thousand species are found in North America. The greater number of these have no very direct relationship to human welfare, but a few of them are of great importance, and, unfortunately, this importance is due to the harm which they are capable of doing.

While the house-fly is not the most annoying member of this order, it is undoubtedly one of the most dangerous, and one of the most difficult to deal with. This insect may complete the cycle of its life in somewhat less than twenty-five days, or in cold weather, its life cycle may extend over considerably more time. Like most of the other Diptera, it passes through four well defined stages of development: First, the egg is laid, preferably in the compost of the horse stable. The egg soon hatches into the larva or maggot. The maggot is a small white worm-like looking creature, which at first is devoid even of a mouth, and depends for its nourishment upon what can be absorbed through its skin. The larval stage is succeeded by the pupa stage. During the pupa state, the fly is enclosed in a hard and dry case and it is while it is enclosed in this case that it undergoes the series of transformations by means of which it eventually comes out from the case a perfect fly.

Contrary to the prevalent idea, the fly does not increase in size after it emerges from the pupa, and the small flies, which are so frequently seen resembling the house fly, are entirely different species of insects. The mouth parts of the house fly are blunt and are entirely unfit for piercing the skin of any animal. Hence, this fly is never a blood sucker. All kinds of human food, as well as almost every description of filth, furnishes food for this insect. It is due to the latter circumstance that great danger arises from the house fly, as the germs of disease in various kinds of filth are readily transferred to human food, and thus arises the danger of human infection. This is so particularly true in regard to the germs of typhoid fever that Dr. Howard of

*Jour. A. O. A., Oct., 1918.

Washington suggests, as stated above, that the insect shall henceforth be known as the "typhoid fly."

A fly which resembles so closely the house fly that it is often mistaken for this insect is the stable fly. In fair weather, stable flies roam the fields far and wide in search of animals whose hides they may pierce and whose blood they may suck. While the mouth parts of this fly are on the same general plan as the mouth parts of the house fly, they are so modified as to eminently fit it for piercing the skin and thus sucking the blood. It is often remarked by country people that "a rain may be expected because the flies bite so hard." Careful observation shows that the biting is done by the stable fly, which quickly seeks shelter as soon as climatic conditions presage a storm.

The house fly almost invariable passes its infancy in the compost around stables or in the excrement of animals, whereas the stable fly passes its larval stage in decaying vegetable matter, or straw stacks, heaps of decaying weeds, *et cetera.* Under favorable conditions, the stable fly reaches maturity about twenty-five days after the egg is laid. In very warm weather this period may be somewhat shortened, and on the other hand, in cold weather it may be considerably prolonged.

Another fly which closely resembles the house fly and the stable fly in general appearance, but which is gigantic in size as compared with these insects, is the horse fly. This large fly spends its infancy in water, coming out of that only when it has reached maturity. Like the stable fly, it is pre-eminently a biting or sucking fly, and a few of them are enough to drive horses into a state of frenzy. The horse fly completes its cycle of development in about the same time as does the house fly and stable fly. It is only the female horse fly that has an appetite for blood, and like its small relative, the mosquito, is quite unable to lay eggs until it has fed several times upon blood. The male horse fly is a strict vegetarian and seldom leaves the vegetable growths around water courses.

Another fly which is widely known, but which many people confuse with some stage of the house fly's development, is the blow-fly. The eggs of this insect hatch within the body of the mother, and so the young maggots pass from the body of the mother directly to the meat on which they are deposited. The fact that the blow-fly is guided solely by the sense of smell is shown by the fly depositing its larvae upon a perfectly bare surface, providing the surface has the odor of decomposing meat. The blow-fly completes its development in about thirty days.

The screw-worm fly is perhaps one of the most savage of the fly group. Its eggs are not infrequently laid around the nostrils of a living animal or a human being, and the young larvae quickly invade the nose. Unless the patient receives early and vigorous attention, it is likely to result disastrously to him, as the maggots are singularly voracious and rapidly destroy the tissue of the head.

The bot-fly does not closely resemble in form or feature these other flies and both its appearance and the note emitted by its wings rather remind one of some of the stinging bees. It is probable that this partly accounts for the fact that the horse swallows the eggs of the fly, which are laid upon the hair of the horses' legs. Certainly the placing of the eggs upon the hair of the horse cannot be a matter of annoyance, but horses seem to fear being stung and so they bite furiously at the fly and in that way get the eggs into their mouths and swallow them.

These flies develop in the stomach of the horse. The larval state is passed almost exclusively in the stomach and when they reach the pupa state, the inert organism becomes incorporated with the general debris of the alimentary canal and is thus passed from the body of the animal. The pupa thus deposited upon the ground, soon gives place to the adult fly, which finds its self in the pasture and under conditions most favorable for again depositing its eggs upon some victim. Ordinarily, the bot-fly seems to do little harm to the horse in whose body it lives, but occasionally they become so numerous as to seriously affect the health of the animal and even to menace its life. The bot-fly requires almost exactly one year for its complete development.

The warble-fly has a rather singular life history. The eggs of this insect are laid upon the mouth or upon the food eaten by cattle and almost immediately develope into larvae, which bore their way through the esophagus of the victim and eventually lodge immediately under the skin of the unfortunate cow or ox. The larvae remain in this position for nearly one year, when they come out full-grown flies, ready to once more begin their evil cycle of life. In many parts of the country the damage to hides is a most serious matter.

The little onion-fly, which is highly destructive to this vegetable in many places, may here be passed over, after calling attention to the fact that it is one more member of the great order of Dipterous insects.

*ABOLISH FLIES BY ABOLISHING FILTH.

I have received several communications of late, some in writing and some verbal, in regard to the desirability of abolishing flies from our city. Many people smile at a proposition of this kind and seem to think that those who speak of it propose to abolish them by some kind of a city ordinance. Nothing of this kind is ever seriously contemplated, but it is a fact that if we should do away with filth we would, at the same time, do away with flies. In other words, much filth, many flies; little filth, fewer flies; absolute cleanliness, no flies.

All of this is because flies of necessity spend their larval state where there is sufficient food supply and the natural food of the infant fly is decomposing organic matter. Around every stable there is always the possibility of enough organic matter to furnish food for flies sufficient to stock a whole neighborhood. If all of the organic matter around stables was kept securely screened, or if lime or some cheap oil was freely sprinkled over it, it would do away with the possibility of its becoming the breeding place for flies. In fact, every kind of decaying matter should be looked upon as the possible home of myriads of young flies.

It would be absolutely impossible to enforce in our city an ordinance sufficiently sweeping to do away with flies unless there was strong public sentiment among our people favoring such an attempt. Few cities are ready for a thing of this kind until several years have been spent in persistent, public education. When we shall take such a step we shall strike a most serious blow at all forms of communicable disease, and the increased health of the community and the diminution of the heavy tax which disease lays upon us will make the cost of cleanliness seem as nothing to us. A lock which saves the casket of diamonds from being stolen is very cheap to the owner of the jewels.

If all of those who desire to better the condition of our city in this particular direction will unite, first, in cleaning up their own yards, and second, in trying to induce their neighbors to do the same, we will rapidly work into a flyless condition, and, as I said before, by so doing we shall greatly reduce all forms of communicable disease.

*So. Pas. Rec., Aug., 1909.

*MOSQUITOES.

It is impossible to write of the dangers of mosquitoes without calling attention to the organism which we have every reason to believe is distributed by this insect. I refer, of course, to the several forms of malarial parasites. It is not improbable that these organisms have played a very important part in the history of animal development. It would be going much too far in the realm of speculation to assert a belief that warm-blooded animals have been developed through the influence of these blood parasites, but it is barely possible that these parasites, or some near relative of them, have been the agents which have changed the history of the world by developing the so-called warm-blooded animals from cold-blooded animals.

There are very few of the lower organisms which are not the victims of blood parasites and in many cases, it is known, that the presence of these parasites results in the production of a fever and that in some cases the fever is destructive to the parasites. Now, it is barely possible that warm-blooded animals have by natural selection been driven into a physiological fever which frees from the danger of many parasites to which they otherwise might be subject. If this is true, there is still a goodly list of parasites which have adapted themselves to the high temperature of mammals and are thus able to live in their bodies despite their high temperature.

The malarial parasites are represented by at least three species: two of these have a cycle of development extending through forty-eight hours. These are the aestivo-autumnal parasites or the Plasmodium praecox, the benign Plasmodium vivax and the more serious Plasmodium malariae. Of these the Plasmodium praecox is the truly dangerous form as this organism is responsible for the most malignant form of malaria. Plasmodium vivax causes the benign tertiary malaria, while the Plasmodium malariae causes the malaria which is intermediate in its nature between the other two.

All of these forms of Plasmodiums must spend a part of their life cycle in the body of the mosquito. It is not known that they ever inhabit the body of any other insect. In the body of the mosquito they pass through their sexual stage of reproduction and by the mosquito are again inoculated into the human body.

It is by no means easy to recognize all forms of malaria by microscopical examination. The parasite begins to affect the human body when about one red corpuscle in one hundred thousand is infected.

*Jour. A. O. A., Nov., 1918.

This means that the average patient shows signs of infection when he harbors about one hundred fifty millions of these parasites. When one considers the enormous number of red corpuscles in the blood, careful calculation seems to show that, if the pathologist finds his parasites at the rate of about one in fifteen minutes, it is about as good as can ordinarily be expected in the early stages of the disease. This means that the ordinary superficial examination which so many physicians make is of little value in incipient cases of malaria.

There is much difference of opinion as to how long an infection of malaria may last. Personally I am inclined to believe that when a person is once infected there is a possibility of the infection lasting during his entire life. It has been suspected that an infected mosquito may transmit its infection to the next generation through the egg, but this suspicion entirely lacks confirmation.

While there are more than sixty species of mosquitoes in North America, there is reason to believe that only one of these is capable of conveying malaria, and these mosquitoes belong to the genus Anopheles. The untechnical observer will most readily recognize the Anopheles mosquito by its curious habit of alighting with its head pointing directly at the wall upon which it rests, while the more annoying non-malaria-bearing Culex mosquito rests upon the wall with its body parallel to the surface. The Anopheles mosquito makes much less noise in flying. The female deposits from twenty-five to one hundred and twenty-five eggs on the water. The length of time required for these to develop into adults is subject to great variation. It is probable that few reach their full development in less than fifteen days.

The male mosquito is a strict vegetarian and is seldom found far from water courses. It is believed that the female mosquito may under favorable conditions live about one month after reaching complete development. When we know that the mosquito must spend its larval period in water, it is not difficult to surmise that the best means of protecting oneself against mosquitoes is to drain all ponds and do away with all standing water in which they develop. Where it is impossible to secure the complete abolition of standing water, the proper course seems to be to cover it with oil, as this effectually prevents the development of the mosquito.

The monetary loss resulting from malaria in California is estimated at nearly three million dollars yearly and it is estimated on good authority that one town in the Sacramento Valley of not over four thousand population suffers a yearly loss of more than seventy-four thousand dollars from this disease. Such figures demonstrate to us the supreme importance of a determined fight being made against a disease which is so easily preventable.

TICKS.

One should not close an article of this kind on the Diptera without referring to the wingless and degraded ticks which are members of this order. They belong to the group which is known as pupipara. This group has received its name because of the fact that the egg is retained within the body of the mother until it hatches, and until the larva is ready to enter upon its pupa state.

The ticks are widely distributed both geographically and zoologically. There are few species of animals which are not infested by them to a greater or less degree, sheep and cattle especially suffering from their ravages. In the Southern states, the business of cattle raising has been most seriously interfered with because of the ticks. Not only do cows suffer because of the blood which they lose, but the pain and annoyance of the tick contributes largely to the unfitness of the cow for either milk or beef. But a careful study of the habits of the tick has made it so that we can say of them as we say of typhoid fever, "that they are more of a disgrace than a misfortune." Already more than one hundred and forty thousand square miles of the South have been freed from this pest.

The life of the tick from the time the egg begins to develop until it is sufficiently matured to begin egg laying is about twenty-one days and the best method of eradicating them has been found to drive cows through a bath containing a solution of arsenic at intervals of not exceeding twenty days. This bath is destructive to the ticks and does the cows no harm.

Not only do the ticks suck the blood of cows and cause them pain, but they are the means of distributing the organism which causes Texas Fever, and strange to say, this organism when in the body of the tick, may be transferred by the eggs to the next generation.

The wonderful success which is attending the efforts to destroy the tick pest is only another evidence of the value of the close scientific study which enables the naturalist to learn the life-history of the form of life he would destroy or control.

FLEAS.

Until recently, fleas had been regarded as members of the order Diptera. Just now they are placed in an order by themselves, but they are so closely related to the diptera that I shall conclude this article by calling attention to the fact that fleas are widely distributed among mammals and that many species of mammals harbor separate species of fleas.

There are at least two disease conditions which are traced to the flea. It seems quite certain that a species of tape-worm, by no means uncommon in the cat, spends a part of its life cycle in the body of the flea and that the cat, by unwittingly swallowing the flea, reinfects itself with the tape-worm.

There is also good reason for believing that the rat flea becomes infected with the Bubonic Plague bacillus when the rat upon which it lives has this disease and that it may, by being transferred to a cat, get upon human beings and in that way transmit the disease from the rat to the people whose house this troublesome rodent inhabits.

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*THE GUARDIAN ANGEL.

In our moments of agony and despair, who of us has not longed for a guardian angel? If we have allowed ourselves to believe that such a thing could exist, we have perhaps thought of it as something so ethereal that it could have little relationship to our common daily life, but in a little magazine issued by the Metropolitan Life Insurance Company of New York we learn that we can all have a guardian angel in the form of a National Department of Health. In this little magazine we are told how this angel will care for us, guard us and protect us; how it will prescribe medicines we should take and proscribe those we should not take. In short, it will relieve us of responsibility in regard to health, and all that it will demand of us is that we shall yield perfect obedience to its mandates.

Surely, the little article is adroitly worded, and if ever a mortal stole the livery of heaven in which to serve the devil, we think it must be the author of these few paragraphs. Now, just as a matter of fact, we all want health and we all want security, but when we purchase even these great blessings by surrendering our liberty, we pay far too high a price. Throughout the ages tyrants have always bestowed their blessings upon the obedient, but the men and women who have been obedient to tyrants have not been the men and women who have made the world a better place in which to live.

Just for the present we believe that the American people will prefer to get along without a guardian angel, and undertake to protect themselves. We may not be successful in all cases, but we will learn some important lessons from our failures.

*Ed., West. Ost., April, 1911.

*MALARIA.

Malaria is a disease which has been known for a long time and its cause and treatment have been discussed from almost prehistoric ages. In 1880, Dr. C. L. A. Laveran, a French army physician, stationed in Algiers, not only discovered the true nature of the disease, but discovered that a special species of mosquito was necessary for its transmission from one person to another. This knowledge is now the common property of the world, and however interesting it may be from a scientific standpoint, it is hardly necessary to record it again in this journal. Indeed, it would be extremely difficult to write an article so elaborate that much new information would be given. My only excuse for offering a few words on the subject of malaria is that there is a healthy tendency at the present time for people to move back to the country, and whoever can do anything toward relieving the congestion of our modern cities is indeed a benefactor of the race. Malaria is preeminently a rural disease and any measures which can be used to diminish the liability to malaria diminishes one of the obstacles to country life.

Few people realize how serious this disease is. Statistics show that in 1909, one hundred and twelve people in California died as the direct result of this disease. It would be impossible to say how many perished indirectly from the same cause. The actual loss in dollars and cents to California during this year amounted to no less than $2,820,000. Almost all of this is preventable, and if we had nothing to consider aside from the monetary loss inflicted by the disease, there would be every reason why we should strive to eradicate it.

As before stated and as is well known, malaria is due to a protozoan parasite which is carried from one person to another by means of certain species of mosquitoes. The disease is not inherent in these mosquitoes and they become carriers of the disease only when they have drawn blood from some person who is already infected. This being the case, two methods of preventing the spread at once suggest themselves. The first and best is the eradication of the mosquitoes. The second is for all persons who are suffering from malaria to be thoroughly screened away from the possibility of the visits of mosquitoes. Were either or both of these methods effectively enforced, malaria would cease to be.

The word malaria means "bad air," and long before the true nature

*Jour. A. O. A., May, 1914.

of the disease was known, it was thought that those who were exposed to air at night were especially liable to contract the disease. It is needless to say that the danger arose entirely from the mosquitoes which flew at night and not from the much maligned "night air." When the parasite has been inoculated into the victim, a considerable time elapses before there are any indications of the disease. The patient does not, as a rule, experience the first "shake" until there is about one parasite to one hundred thousand red blood corpuscles, or until in the person of average weight the parasites have increased to about one hundred and fifty million.

It would be out of place in this article to go into a lengthy description of the several kinds of malarial parasites, as this information may be obtained from almost any of the standard works on medicine, but it may not be out of place to remind our readers that with the increasing trade with the Orient, we are rapidly introducing the pernicious form of malaria into this country and that the proper way to combat this disease is by a nation-wide attack upon the mosquito. This attack will pay for itself many times over, not only in protecting us from disease but in bringing into use lands which otherwise would remain as swamps and which would produce little or nothing of value.

Where drainage is absolutely impossible, the next best thing is to cover the water with a cheap oil. This prevents the breeding of mosquitoes. In many places school children are organized into sanitary brigades, and they not only render much useful service in destroying mosquitoes, but they get their first lesson in the duties of the citizen. With wise and proper management, the mosquitoes may aid us in teaching not only lessons of natural history, but the higher and more important lessons of civic duties and so, like all other burdens which we have to carry, this one may be glorified and may become the means of great good. This is certainly one of the public movements with which physicians of our system of practice may properly identify themselves.

It will be an unfortunate day for real medical progress when either the state or the national government shall recognize any medical system as pre-eminently the state or national system. Until we shall know more than we do now about the nature of disease and the best methods of treating disease, the interests of all concerned imperatively demand that we shall have freedom for all rational systems and special favors for none.

*BEDBUGS AND COCKROACHES.

The order Hemiptera is represented by at least five thousand species of insects in North America alone. It is probable that several other continents are nearly as rich in insects of this order as is North America. These insects are pre-eminently known as "bugs." The typical "bug" is a four-winged insect, the outer or sheath wings being membranous on their outer part and thick, like the sheath wings of the beetle, next to the body. Some of the insects of this order, however, are nearly or quite wingless.

The order Hemiptera is particularly rich in destructive and injurious insects. The Chinch bug is a member of this order, and while it is much less destructive now than it once was, it still causes serious destruction of corn and wheat in several parts of the country. The Aphids belong to this order. The same is true of the San Jose Scale, which is so terribly destructive to citrus fruit trees. The Phylloxera, which has exterminated grape vines in many places, is a Hemipteran. The "kissing bug," which by the way is no joke, but a serious reality, is a Hemipterous insect from one-half to two-thirds of an inch in length. This insect causes most painful and often serious injuries by driving its long, sharp beak into any object with which it may come in contact, and thus not only inflicting a severe wound but injecting poison into the object thus pierced. The Cicada, sometimes called the Seventeen-year Locust, is another true bug. This insect spends nearly seventeen years of its life in larval form. This larva lives in the ground among the roots of trees and plants doing comparatively little damage, but after spending seventeen years living in this way, it emerges from the ground in its imago state and spends a few weeks of life in the air and sunshine. During this time it lays its eggs on the branches of trees, stinging these branches and injecting a poison in them which causes them to die quickly and drop from the tree, thus carrying the eggs to the ground and making it easy for the larvae as they emerge from the eggs to burrow in the earth.

A degenerate member of this order is the bedbug (Acanthia lectularia). This small, flat insect is wingless or has wings represented only by small scales on the sides of its body. The female bedbug lays her eggs during the spring, depositing some two hundred eggs that are pro-

*Jour. A. O. A., June, 1914.

duced in lots of about fifty. These batches of eggs are all produced within a few days. The eggs hatch in about seven days and the young pass through their larval stage in a short time and reach maturity. As a general thing, only one brood is produced during the year. The peculiar odor of the bedbug is derived from glands which probably make the insect offensive to other insects which otherwise might destroy it. Aside from being a severe pest in biting people, the begbug is certainly one of the means whereby relapsing fever is transferred from one person to another. The last severe outbreak of this fever in the United States was in 1869, but occasional cases are known from time to time in our seaport cities. The proper remedy, first and above all, to employ against the bedbug is cleanliness. The abolition of the wooden bedstead and the substitution of iron and brass beds, certainly go very far towards destroying the habitation of this detestable insect. If beds and the walls and floors of rooms become infected with these insects, it is probable that there is nothing better to use than a 1:500 solution of corrosive sublimate in water. This generally will destroy not only the adults but also the unhatched eggs. Where it is practicable to use kerosene oil, substantially the same results may be obtained with this agent. The popular idea that bats bring bedbugs to the houses is fallacious, though it is true that bats, as well as mice, are frequently infected with a parasite closely related to the bedbug and resembling it so closely that uncritical observers have mistaken it for the unwelcome guest of the bed chamber.

The order Orthoptera is founded upon the fact that the edges of the wings of these insects form a straight line when the wings are folded to rest. Many of the insects of this order are either singers or leapers, or both. Some of the Orthoptera are so musical that the Japanese keep them in their homes in cages for the sake of their songs. The grass hoppers and crickets are both singers and leapers. The cockroach, which is a most detestable insect, belongs to this order. The ordinary lady of the house is almost insulted if you suggest the possibility of her kitchen being the habitation of the cockroach; and, indeed, if one seeks during the day to find the insect, he may find it impossible to do so, but when all is still at night, he may find them coming forth in considerable numbers and enjoying a feast on scraps and crumbs which may remain in the kitchen. These insects are particularly troublesome on ship-board, and sailors who have come around the Horn to our harbors not infrequently wear gloves at night to prevent their nails being eaten off by these ferocious insects. The insect has very strong jaws and it seems to especially prefer food which utilizes their strength.

The cockroach lays its eggs throughout the year and it requires nearly one year for the young to undergo complete development. It can readily be seen that insects of this character may readily become the carriers of disease. Indeed, all infectious skin diseases are readily transmitted by the roach, and public and private safety require that these insects shall be exterminated so far as possible. The remedy to be employed against them is cleanliness and the closure of all cracks and crevices where it is possible for them to obtain shelter.

*SPORTS.

We believe that the time has come for a definite protest against the importance which is attached to sports at the present day. Some entire newspapers are devoted to sporting news, and a number of our large daily newspapers print entire departments devoted to reports of games. This tends to give the average young man an exaggerated idea of the importance of these things. It leads him to feel that it is a matter of real import as to who shall win in a game of baseball or football, or some other sport, and in this way his attention is drawn away from matters that are of vast moment to him. The story is told that when Alcibiades, the tyrant of Athens, meditated some unusually atrocious act, he first cut off his dog's tail, and while the people were discussing the mutilation of the dog, he accomplished his infamous purpose. There is a certain line of political tricksters at the present day who are quite willing that the average man shall be more interested in baseball and football than he is in the effects of certain provisions in the charters of cities, and while the voter is eagerly discussing which college team is most likely to win in the coming contest, charter amendments, far reaching in their importance, are accepted or rejected with little thought on the part of our people.

I believe that we should train our young people to think of sport as being important only for sport's sake. It is important in a game of football that the game should be played vigorously and fairly. It is a matter of absolutely no importance as to which side shall win. A foot race between boys is good, but providing that both boys conduct the race in such a way that each gets healthful exercise, it is a matter of no importance as to who wins. If we are right in regard to these views, it is time that a public sentiment supporting them should be cultivated.

*West. Ost., April, 1918.

*THE SPOTTED FEVER TICK OF THE ROCKY MOUNTAINS.

Before the advent of the white man to Montana it was a matter of common knowledge among the Indians of the Bitter Root Valley that they were subject to a severe and frequently fatal form of fever; it is also known that they thought the region where they were subject to this fever had very definite geographical boundaries. It is now known that the same disease is found not only in Montana, but also in Idaho, Oregon, Washington, Nevada, Utah, Wyoming, and Colorado, and to a limited extent in the northeastern corner of California.

No scientific study of this disease was made until 1902. In that year Doctors Wilson and Chowning announced their belief that the wood-tick, which is common in the region in which this disease prevailed, was in some way the agent by means of which the disease is transmitted from one human being to another. Their belief was based upon three facts which they had observed; the first was that in a large number of the cases of spotted fever, as the disease was commonly called, the patients were able to give a definite history of having suffered from the bite of a wood-tick; the second was that ticks are especially abundant in the region in which the disease may be contracted; and the third fact was that the season of the year in which spotted fever was most common, was the season when the ticks were most active.

The beliefs of these doctors remained without definite confirmation until 1905, in which year some careful experiments were made at Boise, Idaho. In these experiments it was definitely proven that not only human beings, but guinea pigs became infected with spotted fever when they were bitten by a tick which had previously been upon the body of a spotted fever patient. These experiments were repeated the next year, at the University of Chicago, by Dr. H. T. Ricketts, who seems to have been unaware of the work which had been done at Boise. His experiments confirmed the views which had been formed as the result of the work at Boise. Dr. Ricketts found that both the male and female tick are capable of transmitting the disease. He also found that the larval tick may not only acquire the disease and retain it through its moulting period, but that it may transmit the disease either while it is still in the larval state or after it has reached its adult condition. He also made the highly interesting and important discovery that if the

*Jour. A. O. A., Jan., 1918.

female tick became infected she may, through her eggs, transmit the infection to the next generation.

Dr. Ricketts' experiments proved five important facts: First, guinea pigs and monkeys are susceptible to spotted fever; second, larval ticks may become infected, either from inheritance from an infected female or from a human being, and they are then capable of transmitting the disease during any after part of their lives; third, what is true of the tick during the larval stage is equally true during the nymphal stage; fourth, adult ticks are able to acquire the disease and to transmit it through their eggs to the succeeding generation; fifth, ticks capable of causing the infection are found in nature.

Since the only known means by which this disease can be spread is by means of this particular tick (Dermacentor venustus) it follows that the area through which spotted fever may be spread must be coincident with the region inhabited by this particular tick. This fact has lead to a very careful study of the range of the tick, and it is found that it belongs especially to the Rocky Mountain region. Denver appears to be on the extreme eastern border of the region which it inhabits. The tick is not known at all in Arizona, and there is only a very small part of Northern New Mexico where it is found. It is abundant in northern and central Utah, but is not found in the extreme south of that state. Western Nevada and all of California are free from this pest with the exception of a small part in the extreme northeastern part of the latter state.

One of the remarkable features of spotted fever is the fact that the disease appears to be of widely different virulence in different localities. In Idaho the death rate varies from five to seven per cent.; in Bitter Root Valley in Montana the death rate is said to be as high as seventy per cent. It is possible that the treatment which the victims of this disease receive may partially account for this wide variation in death rate. In Idaho there are at the present time about five hundred new cases each year, and from the whole area subject to spotted fever there are more than seven hundred and fifty cases each year. It is a matter of great importance to the State of Montana to have this disease carefully studied and some means found for the protection of the people from its ravages, for while Bitter Root Valley and some other parts of the state subject to this disease, are from many standpoints desirable localities in which to live, settlers will not be very likely to go there while they are confronted by this serious danger. There are careful observations being prosecuted at the present time to determine just why it is that the disease has been so terribly virulent in the Bitter Root Valley.

While the tick appears to be the unquestionable agent by means of which the disease is spread, it is probably needless to say that the tick is dangerous only when it has been in contact with a person suffering from the fever. One of the victims of this disease moving to a region where the disease has not yet appeared, but where the tick is abundant, may be the means of widely infecting ticks, and in that way make it possible to spread the disease. On the other hand, infected ticks may be transferred either by animals or by merchandise to regions where the disease has not yet appeared, and in that way the disease may be spread. It is evident that great care should be exercised in regard to all goods shipped from the Rocky Mountain region, and especially from regions where this disease has made its appearance. While there are a number of species of ticks inhabiting this region, there is, so far as known, but one species which attacks man, so this species is the only one which is of especial importance from the standpoint of public hygiene.

It is not at all improbable that when the life history of the spotted fever tick shall be fully known, some easy means may be suggested for its control, if not for its complete destruction.

It is needless to urge the point that the prevention of infection is much more important than is the means of treating this disease when once contracted, and the prevention of the disease is almost purely a biological problem. It is diseases of this kind which makes us feel the importance of the physician possessing an all-around education. It forces us to the belief that he should possess not only a broad knowledge of the human body as a basis, but that he must possess at least a partial knowledge of a wide range of more or less nearly allied subjects.

Some people are still inclined to underestimate the importance of the etiology of disease. But the careful physician recognizes more and more that not only is his treatment of disease influenced by its etiology, but that he is powerless to aid in the prevention of the spread of disease unless he is fully acquainted with its cause. Only a few years ago whole cities suffering from yellow fever were placed under quarantine. Now we know that the yellow fever patient may be cared for without danger to the nurse, providing care is taken to exclude mosquitoes which might spread the disease.

*THE PROTOZOAN.

The word Protozoan means the first or most primitive form of animals. The true Protozoan consists of only a single cell, although some of the animals placed in this group live in communities which closely approach the condition of a multicellular animal. It is by studying some of these grouped forms that one is enabled to get a conception of the way in which the multicellular animals arose from the unicellular forms. Not many of the unicellular animals are extremely complex in structure, and while they are able to boast of only one cell, still within the boundaries of this cell may be found contracting vacuoles, a more or less distinct alimentary tract, an occasional spot which appears to be sensitive to light, and in some cases structures which are capable of producing phosphoresence.

Of the hundreds of known Protozoa only a few are known to ever live either within or upon the human body, and of the few which are human parasites a very small proportion is injurious. One of the injurious forms is the Amoeba dysenteriae. This parasite is from twenty to fifty microns in diameter. It is usually mononuclear, although the nucleus occasionally becomes fragmented. The protoplasm is granular and the cell wall is imperfectly, or not at all, developed. When this Amoeba becomes parasitic in the human body it is usually found in the wall of the colon, where it may be the cause of very serious, and sometimes, absolutely fatal illness. The patient suffering from an attack usually has a very severe dysentery. After the solid material in the alimentary canal has been ejected, the movements of the bowels consist of a watery secretion in which there is a mingling of more or less blood and mucus. It is from the latter that a positive diagnosis of conditions may be made.

For this purpose the mucus should be lightly washed with water and then spread on a warm slide and examined with a moderately low power objective. One-quarter to one-sixth-inch objectives are likely to give the best results. If Amoebae are present, they can usually be detected in the mucus by their slow amoeboid movements. If the slide upon which the examination is made is not warm, there is danger that the Amoebae will be quiescent, in which case it is very difficult to distinguish them from disintegrating epithelial cells. If for any reason they are not found in the first examination, another examination from a subsequent movement of the bowels should be made. Cases are not

*Jour. A. O. A., April, 1914.

infrequently recorded where the Amoeba is found in large numbers in the pus discharged from an abscess of the liver.

The relationship of the Amoebae to the abscess is somewhat problematical, but until we have more evidence to the contrary, it appears probable that the abscess is due to an infection of this animal. Wherever the infection of this Protozoan may be, it is to be regarded as a serious matter. An infection of the liver is especially difficult to treat, not only because the organ is inaccessible, but also because it frequently happens that the nature of the infection is only known as a result of post mortem examinations. When the colon is infected, the result is what is known as tropical or pernicious dysentery.

It is no part of my plan in this department to discuss treatment, and yet as I have had personal knowledge of several cases of this dangerous infection, I may perhaps be excused for saying that thorough and long continued washing of the colon with water enemas has yielded very satisfactory results. In the cases of which I have had knowledge, enemas have been continued for nearly or quite an hour at a time, and water by the tens of gallons has been injected and allowed to run out, as a result of which the parasites seem to have been washed away.

Several other species of Amoebae are known to occasionally inhabit the alimentary canal, but I do not know of any reports which would lead one to attribute any serious results to them. It is almost certain that the Amoeba dysenteriae is conveyed from one person to another by polluted water. All water which can possibly be contaminated with sewage is dangerous, not only for household purposes, but also for the purpose of irrigation where plants like lettuce, onions, radishes and other vegetations that are eaten uncooked are concerned. In one case of which I had personal knowledge, the infection seems to have occurred through milk vessels in which raw vegetables irrigated by sewage had been washed. To make a long story short, I must again say that protection from this parasite is to be attained through cleanliness.

Another Protozoan which is responsible for a serious infection is the Trypanosome gambiense. This is a flagellate protozoan belonging to the family Tryponsomidae.

Aside from the organism which produces sleeping-sickness in human beings, there are several of the Trypanosomes which are serious pests to animals. The disease known as Nagana, which destroyed large numbers of wild animals in South Africa, is caused by a Trypanosome. Suria, which is rather common among the wild animals of India, is caused by another. Dourine, which affects horses in most warm countries, is a third. Cattle bane of South Africa is due to still another member of this evil genus and the Spirochaeta pallida, which causes human syphilis, is a closely related form of life.

The infection caused by T. gambiense takes two forms. Both have been known for more than one hundred years. The first is characterized by severe anemia, emaciation, enlarged spleen and lymph nodes, together with great prostration; the second and more typical causes profound lethargy whence its popular name of sleeping-sickness. When the disease was first known, it was confined to a small area of country on the west coast of Africa, but with increased travel it has spread to the eastern coast, and is now by no means uncommon in the great fertile region around the head waters of the Nile river.

The only known means of transfer of the Trypanosome from one person to another is by means of the fly known as the Glossina palpalis or the Tse-tse fly. This fly belongs to the group of Dipterous insects and is a serious pest wherever it lives. A careful study of the life history of this fly suggests the natural means for control of sleeping-sickness. While the Tse-tse fly, like most other of the dipterous insects, is extremely prolific, it can produce its young only where it has access to running water. There is fortunately one other condition necessary for the development of this fly—a thick undergrowth of weeds and brush within three hundred feet of the edge of the stream. Violate the condition of running water with banks covered with underbrush, and the breeding of this fly becomes an impossibility. So, of course, the rational method for the control of this disease, is to keep the banks of streams clear of brush and high grasses. When this is done, the Tse-tse fly is abolished, and then the transmission of the Trypanosome becomes impossible.

During the days of the slave trade, sleeping-sickness was by no means uncommon in our Southern States among the newly imported negroes, but because of the absence of the fly, the disease never became epidemic. When a person once becomes infected, the chances for his recovery are few indeed, so safety is almost entirely dependent upon avoiding infection. It may be of interest to our readers to mention the fact that as early as 1843 it was found that Trypanosomes were by no means uncommon in the blood of frogs and two years later they were discovered in the blood of rats. It is not known that either of these animals is capable of furnishing the means for human infection.

It is examples of this kind which lead us to feel the extreme value of research institutions. The work of the explorer is nearly done, but the work of the sanitarian is still in its infancy.

*PROTOZOAN DISEASES.

Our increasing knowledge of the world in which we are living adds new force each day to the thought that every fact is in some way related to every other fact, and that he who would know one thing well must know something of everything.

Anyone who will take the time to examine old files of catalogues of medical schools will see how slowly but surely the field of the physician's education has enlarged. It is not many years ago that biology first became a part of the education of the physician. This subject was added to his curriculum not because any one supposed that it had a close relationship to his future work but because it was believed that a broader knowledge of life would add to his general culture and give him a broader outlook than he would otherwise possess. With increasing knowledge, however, it has been found that one can no more be an all-round physician without being a biologist than he could be a successful surveyor without a knowledge of mathematics.

For the last twenty years or more the critical student of the human body has known that a considerable number of diseases are due to bacterial invasion of the body. For a somewhat less length of time he has known that bacteria are more nearly related to vegetables than to animals. Until recently his attention has been so closely fixed upon those diseases known to be due to vegetable or bacterial invasion that he has given little or no heed to diseases which are caused by animal parasites. The investigations of the last ten years have thrown a wonderful flood of light upon a considerable number of tropical diseases of an infectious nature which are positively traced to animal organisms rather than to plant organisms. The animals producing these diseases belong to the sub-kingdom protozoa and they are characterized by being unicellular in structure. A few of them may pass directly from one animal to another but the greater number of them spend a part of their lives in some intermediate host, and this host, in a considerable number of cases, is found to be some insect.

Many of these protozoan diseases are extremely serious in their nature. In fact, most of them do not yield to any treatment with which we are at the present time acquainted, and it is by no means improbable that we shall eventually find that the only way to deal with them successfully is by prevention, and in order that we may intelligently pre-

*Jour. A. O. A., Nov., 1910.

vent these diseases it is necessary that we should not only understand the nature of the organism producing the disease, but that we should thoroughly understand the life history of the intermediate host by means of which the organism is conveyed from one person to another. In coming to the Pacific Coast our eastern friends passed over hundreds of miles of plains which at one time were the home of herds of horses perhaps as numerous as were the buffaloes in the days of our fathers, and the place where we meet today was once inhabited by the mammoth, camel, and giant sloth and large numbers of other animals now extinct. What became of them? And why did they disappear from a region which appears to have been so favorable for their lives? Many answers have been given to this question but until comparatively recently none of them rested upon anything more substantial than speculation.

A few years ago there was found in the shale of some of the late geological deposits of the Pacific Coast remains of a Tse-tse fly. The species is not exactly the same as that which renders parts of Africa uninhabitable today but a species closely allied to that dread insect. The evil of this insect consists not in itself, for it is probably no more annoying than many other insects, but it acts as the intermediate host of the protozoan parasite which is absolutely fatal to the animals infected with it. In other words, an explanation of the disappearance of those great animals which were once so abundant may be that they were destroyed by the protozoan parasites with which they were inoculated by insects, in very much the same way that animals and people are inoculated at the present day.

There are now considerable parts of Africa absolutely uninhabitable for the horse, dog and cow, and there are other parts which have long been known as the "white man's grave," and all of this not from any "miasm" or inherent unhealthfulness of climate but solely from protozoans which are conveyed by insects.

It is said upon good authority that malaria is the great scourge of the human race and that more people die from malaria than from any other disease. As one form of malaria, at any rate, is a disease with which we are all of us more or less familiar, I am going to follow through with some care the life history of the malarial parasite, and we may properly regard this as being typical of all protozoan parasites which have a host intermediate between the human victims.

In this case the protozoan host is a mosquito, belonging to the genus Anopheles. It is a curious fact that if the malarial parasite is taken into the body of the common mosquito (Culex) it is straightway digested and thereby killed.

In giving the life history of the malarial parasite, it is perhaps best to begin with it in the human blood. In the human blood the malarial parasite first appears as a minute gelatinous mass, belonging to the group of protozoans known as the sporozoa. It is quite possible that the organism producing both smallpox and scarlet fever belong to the same group, though this is not positively known. This gelatinous mass in the human blood soon buries itself in a blood corpuscle and in this red corpuscle it undergoes cell division, producing from 6 to 12 new dividuals. These are extruded in the general blood stream and like the original mass soon embed themselves in blood corpuscles where the process of reproduction either by sporulation or cell division is repeated. In this way the number of parasites repeatedly increases, and in common tertian malaria in about two weeks' time they have reached such numbers as to seriously affect the health of the individual harboring them. If the blood of the patient is drawn and is exposed to a lowered temperature, many of these parasites undergo a marked change. Processes resembling pseudopodia (or false feet) are rapidly shot out from the protoplasmic masses. These become easily detached from the parent mass and for a short time they display a remarkable vitality. If they come in contact with other malarial parasites which do not produce pseudopodia, the pseudopodia are readily absorbed by these. Of course, when this occurs in an ordinary drop of blood drawn from the body, it is of no significance, whatever, but if the parasite is taken into the body of the Anopheles mosquito similar changes occur and this is full of significance. The pseudopodia which form on malarial parasites in the body of the mosquito are really gametes, or true male cells and their union with non-pseudopodia producing parasites results in true fertilization. This sporulation in the body of the mosquito is soon followed by a rapid self-division of the fertilized individuals and the parasites thus formed, by passing through the tissues of the mosquito, work their way into glands whose secretion is forced into the human being whose blood the mosquito sucks. In this way the cycle of the parasite's life is completed and it is ready to begin again.

It has been suggested by some very able biologists that the action of these blood parasites has been of far-reaching significance in the history of animal life; that not only have they caused the destruction of large groups of animals but that they have been the means of forcing cold blooded animals, or animals whose temperatures are subject to continual variation, into a fever which has become physiological. In other words, that they possibly give us a clue as to how warm blooded animals may have developed from those whose temperatures was subjected to variation. Whatever may be the value of this speculation, the fact remains that the blood parasites have had a remarkably wide distribution, both in time and space. We have positive evidence that animals in the tertiary geological period suffered from them, and they certainly belt the earth with a girdle extending almost from one frigid zone to the other. It is estimated that five million people perish every year in India from pernicious malaria, and there are at least two million new cases which develop each year in Italy with a death rate of fifteen thousand annually.

The protozoan producing amoebic dystentery belongs to the group Sarcodina. As I have already discussed this matter at some length I pass it at this time.

Another protozoan group of wide-spread importance is the Mastigophora. These unicellular organisms are characterized by possessing one or more flagella, by means of which they secure their locomotion. Sleeping sickness is due to one of these organisms. While the disease is largely confined to equatorial Africa, a few sporadic cases have been observed in the United States. The disease is due to the Trypanosoma gambiense, and, like several of its near relatives, which affect animals, it is conveyed by the Tse-tse fly. In other words, the Trypanosoma passes a part of its life in the human being and the rest of the cycle of its life in the Tse-tse fly. It is now a well known fact that while the large animals of Central Africa have become immune to the Trypanosoma our domestic animals are quickly destroyed by it.

Syphilis appears to be produced by the spirochete (Treponema) pallidum, another member of the group Mastigophora. Still another member of this group is responsible for the tick fever, which is rapidly becoming a dreaded disease in Montana, Idaho and some of the other mountain states. At the request of the Department of Agriculture, I have made a somewhat careful examination of dairy cows in and around Los Angeles, but I have failed to find on them any of the ticks which form the intermediate host of the Trypanosoma producing the tick or mountain fever.

In a multitude of blind men, one man who has only one eye will be king, and among medical practitioners the leaders must inevitably be those possessed of the best education.

*AMOEBIC DYSENTERY.

There are disadvantages as well as advantages in becoming a world power. One disadvantage is that world-wide commerce brings to our shores many diseases which we would have known only by name had our commerce been less extended. Among these diseases may be mentioned Tropical Dysentery, or, as it is more commonly called, Amoebic Dysentery. Amoebic Dysentery is a disease of long standing in tropical and oriental regions. It is caused by the Amoeba dysenteriae. This is a protozoan belonging to the class Sarcodina and to the sub-class Rhizopoda. The Sarcodinae are the lowest forms of the Protozoans. They may be either naked or provided with a well-marked shell. They move by means of finger-like projections known as rays. The Rhizopods, like the class to which they belong, include both naked and shelled forms. The Amoeba is a naked organism and it looks not unlike a shapeless mass of jelly. While living at ordinary temperatures it gradually changes its shape. There are ten or more species of Amoebae, though the distinction between the species is not always very clearly marked. As before stated the organism which is believed to cause Tropical Dysentery is generally known as Amoeba dysenteriae, though some writers place it in a different genus and call it the Entameba histolytica. The parasite is from 15 to 25 microns (3-5000 to 1-1000 inches) in diameter and it is most readily found in the mucus passed from the bowels of patients suffering from Amoebic Dysentery.

As the Amoeba may easily be mistaken for an epithelial cell, great care is necessary in making the laboratory examination. In six cases which I studied with great care last winter I found that methylene blue gives a very satisfactory stain, but in each case I made a positive diagnosis only after finding living and moving forms. To find these the mucus must be fresh—not more than six hours old—(and fresher than that is better) and it must be examined on a warm stage in moderate light. They can be studied to great advantage with a 1½ inch eye piece and a 1-10 inch objective, but they can be identified with somewhat less magnification. They are described and figured in so many works on medicine that I forbear an extended description of the organism.

The Amoeba may inhabit both the large and small intestines as well as the cecum and sometimes the appendix. They may be carried by metastasis to the liver, the lungs, or indeed to almost any part of

*Jour. A. O. A., Aug., 1909.

the body, and in these new fields they may produce serious and even fatal abscesses. The abscess produced by Amoebae is usually inclined to burrow deeply and thus in the intestine may advance to the stage of complete perforation. When the Amoebae are carried to the liver an abscess may form which may eventually rupture either through the body wall, into the right lung, into the body cavity, into the stomach, into the colon where it touches the liver, or into the right kidney. In any of these cases the result is likely to be fatal. It sometimes requires a long series of examinations to prove positively the presence of Amoebae in the pus in an an abscess of this character.

The disease is spread almost entirely by food or drink. The Amoebae are abundant in the feces of patients suffering from the disease and if water used for drinking or culinary purposes becomes contaminated in any way with this matter it is easy to see how it can act as a carrier. If water thus contaminated is used for the irrigation of green vegetables, it is easy to see how these may carry the disease.

In a recent outbreak of the disease in Pasadena a careful analysis proved almost conclusively that the amoeba was brought into the house on green vegetables,—probably lettuce. The lettuce was washed in a dish pan in moderately warm water. The same dish pan was used, without scalding, to wash milk vessels which were not scalded but which were placed in the sun to dry. Milk was afterward placed in these vessels and it appeared that the Amoebae which were thus introduced into the milk reproduced themselves abundantly in the milk. That is, the milk acted as a culture medium, and in one sample which I examined the Amoebae were numerous in milk 12 hours old. So far as I have been able to ascertain this particular species of Amoebae is not a native of the United States but it has been brought here by persons who have become infected with it in its native habitat. We must expect an increasing number of persons suffering with this disease to come to our shores and scatter over the United States. Unless we protect ourselves, not only by good personal hygiene but also by public sanitation, we shall suffer severely from it. If there is one word in which is summed up protection against Amoebic Dysentery as well as Typhoid Fever,—and in fact most other diseases,—that word is "cleanliness."

Until recently comparatively few small towns felt that they could afford the luxury of a sewer, but with our broader knowledge of the way in which diseases are spread, and our better appreciation of the cause of sickness, we should feel that a sewer is not a luxury but a necessity. Even from a cold-blooded standpoint of dollars and cents, sewers are very much cheaper than either funerals or prolonged cases of illness. A good cess-pool may indeed be regarded as a substitute for a sewer, but a truly good cess-pool is such a rarity that could one be found it should be put in a museum as a valuable specimen. They not only contaminate the ground for a considerable distance around them, but they are always subject to unexpected overflow. When this occurs it is needless to say that they are a serious menace. A cesspool infected with Amoeba dysenteriae might, by one overflow, endanger the entire neighborhood.

If osteopaths are to occupy the place in the public mind which their interests demand, they must be alert in all matter relating to the general good, and their devotion to the art and science of treating disease must not prevent their close study of the great problems of public hygiene.

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*A STRANGE INTESTINAL MASS.

Early in September of the present year a physician of this city sent an elongated mass, passed from the bowels of one of his patients (a man 60 years old) to the Histological Laboratory for examination. The mass was about equal to a lead pencil in diameter, and the total length passed was something more than a meter. The first appearance suggested some giant nematode worm, but a brief study of the object dispelled that view.

A careful examination showed that the whole mass was composed of epithelial cells held together by mucin. Within this mass were large numbers of *amoeba coli.*

It is impossible to say whether there is a causal connection between these parasites and the epithelia-mucin mass or whether their presence in it is purely accidental.

To what extent, if any, this amoeba is pathogenic is not known. The fact that it occurs regularly in certain forms of dysentery is strongly in favor of its being a pathogenic form.

*The Osteopath, P. S. Q., Oct., 1900.

*A FEW HUMAN PARASITES.

Organic reproduction is far in excess of the possibilities of organic life, and because of this a constant struggle for existence is inevitable. These facts are now admitted by all competent naturalists. The struggle for an opportunity to live has caused every available nook and corner to be occupied by some form of life.

"And there's never a leaf nor a blade too mean
To be some happy creature's palace."

In this life and death struggle some forms of life have depended upon their power to compete with their fellows in "open field and no favors." Others have sought to live because of their obscurity and because they were in no one's way, or, if they were in the way, because they were inaccessible. Among mammals the lion lives because of his courage and strength; the mole lives because he keeps out of the way. Among vertebrates the bee lives because of its courage and its high grade of intelligence, while the safety of the earth worm is based upon its security.

In this general struggle for some place of abode we need not be surprised that some animals and plants have found a congenial home upon, or within, other animals or plants.

These organic forms which live upon or within others, and more or less upon their food or tissues or upon both, without causing immediate death, are known as parasites.

All forms of organic life are so closely linked together that it is by no means easy to point out the exact grades of parasitism. Professor Van Beneden recognizes three grades of organic relationship.

Animal messmates are those which live in such relationship with another as to secure a part of the food which the other animal had designed for himself. In other words he seizes for himself the food provided for another.

Many examples of messmates among marine animals might be cited. There are fish which habitually live in the mouths of other fish; many species of crustacea are found attached to fish and marine mammals, and worms are found upon the backs of crabs. In all of these cases the messmate does not injure the tissues of his host in the least, he simply eats the raw material which the host has provided for himself.

After the messmate the next step toward parasitism is mutualism. The mutualist among animals is one which lives upon the body of another, but secures food without reference to the food of its host.

Many insects are mutualists with birds and mammals. In some

*The Osteopath, P. S. O., Oct., 1900.

cases they feed upon the epidermal cells which are shed by the host and thus are an advantage to the animal which shelters them, but it is a very short step from feeding upon the dead epidermal scales, to feeding upon the tissues which are still living. When this is done we have a true parasite.

Parasites which live upon the surface of the body are known as ectoparasites, while those which live within the body are endoparasites. The animal ectoparasites are mostly insects or their near allies, while most of the animal endoparasites are worms.

There are two groups of worm which furnish human parasites. These are known as Platyhelminthes or flat worms, and Nemathelminthes or round worms. To the first division belong the tape-worms and flukes, and to the second the Ascaris and Trichina.

Aside from the endoparasitic worms the human body may be infested with several unicellular animals and a very large number of unicellular plants. Among the most important of the latter are various species of bacteria.

Of all the internal parasites tape-worms are the most widely known. Four different species are not infrequently found in the alimentary canal of man. These are the Taenia solium, Taenia saginata, Taenia nana, and the Bothriocephalus.

All tape-worms have substantially the same life history. If we start with the mature worm in the alimentary canal of a human being it is found to consist of two well marked parts; a slender unsegmented part just back of the anterior enlargement which is known as the head, and by means of which it is fastened to the intestine, and a more or less elongated part distinctly segmented. Each of the segments is known as a proglottid, and it is capable of living an independent life for a short time after it is separated from the rest of the worm. Normally these proglottids break off from time to time and are expelled from the body of the host. As fast as the segments are separated from the worm, new ones are formed and this may go on indefinitely. Within each segment or proglottid are found the organs of generation, both ova and sperm being produced in each one.

When the proglottids are expelled from the body they may move about to some extent, and as they are well filled with eggs before they detach themselves from the parent worm, every movement ejects eggs from them. If these eggs are swallowed by some animal, a pig or an ox, for example, they soon hatch in its alimentary canal; the embryo then bores its way through the intestinal walls and enters some muscle where it comes to rest, or it may enter a blood vessel and be carried to some distant part of the body.

Wherever it comes to rest it rapidly increases in size and develops into what is known as a bladder worm or cysticercus. This foreign body is at once attacked by the white blood corpuscles or leucocytes, and since they cannot dissolve it they collect around it in great numbers and gradually become transformed into neutral tissue, thus shutting the worm up in an impervious sac.

In this condition the worm remains until its host dies. If its flesh is then eaten by man, the bladder worm (if the meat is imperfectly cooked) may find its way to the stomach, and there the cyst enclosing it may be dissolved and the worm liberated. The worm thus set free quickly attaches itself to the wall of the intestine either by suckers or hooks and rapidly increases in length. The posterior end of its body now develops proglottids, and its curious life history is ready to repeat itself.

The intermediate host of Taenia solium is usually the hog, though occasionally the larval worm is found in the sheep. Taenia saginata passes its intermediate stage in the flesh of the ox. The life history of Taenia nana, or dwarf tape-worm, is unknown. It probably passes its larval life in the body of some insect or possibly in some land snail, but how it gets from this host into the human body is a mystery. It may be that fragments of dead insects containing these larvae fall into food and are unconsciously swallowed.

Bothriocephalus latus passes its larval stage in the body of a fish. It is said to infest the pike more frequently than other species. There are some other species of tape-worms occasionally found infesting man, but the four named are the most common ones. In this country Taenia saginata is by far the most common form. It may reach a length of twenty-five feet or more, and its effect upon its human host is very variable. In many cases no appreciable disturbance of the system results, while in other cases most serious nervous and digestive complications are observed. The safeguard against any and all of the tape-worms is never to partake of flesh which has not been thoroughly cooked. Great care should always be observed in handling tape-worms, as their eggs are very small and might easily be introduced into the body. Such an accident might be very serious, for, as already stated, the larval worm may find its way into the blood-vessels and in this way it might be carried to the brain or some other vital organ.

The Distoma or liver-fluke is another flat worm which has been found in the human body, and which sometimes produces serious results.

The life history of the worm suggests the best means of guarding against it. The mature fluke, which may be in the liver of a sheep, ox, or man, lays a great number of eggs which pass into the intestine with the bile and from there are expelled from the body. A single fluke may lay nearly half a million eggs. The embryo breaks from the eggs two or three weeks after they pass from the body of the host. If the eggs were dropped in a dry place the young worms quickly perish, but if the eggs fall into water the embryos swim about most actively for several hours. If during this time one comes in contact with a certain species of water snail it quickly bores its way into the snail's body and becomes encysted there. It is now known as a sporocyst.

Certain cells develop in the sporocyst which give rise to separate animals, each of which is known as a redia. Each redia in its turn produces, by means of unfertilized eggs, a large number of young, which are called cercariae. These wriggle out of the body of the snail into the water, and their future development depends upon their being swallowed by some animal in whose liver they can develope.

It will be noted that water which can in any way be infected by flukes is extremely dangerous to drink, and any water which is in the least contaminated by either cattle or sheep is in serious danger of such infection.

Among the Nemathelminthes, or flat worms, the Trichina spiralis is best known and is most dangerous. This worm is about one-twentieth of an inch long in its mature condition, and is about as large around as a hair. It may reach its mature state in the bodies of several different animals, but it must always live in the bodies of two individuals before it reaches maturity.

Among domestic and semi-domestic animals it has been observed in the bodies of rats, chickens, cats and pigs.

If we should start its life history with its living in the muscles of a rat, the worm would undergo no change until the death of the rat. If the rat should not be eaten, the Trichinae would perish when the flesh of the rat decomposed, but if the flesh of the rat should be eaten either by another rat, a cat or a pig, the cysts in which the worms were living would be dissolved in the stomach of the animal which ate it, and the worms would be set free.

Up to this time the worms were larvae and were unable to produce ova and sperm. Now, however, they quickly reach their sexual maturity, and they begin to produce eggs abundantly.

While the mature worm never seeks to leave the alimentary canal of their host, the young worms immediately begin to bore out, and soon they are encysted in the muscles by the same process as that which encysts the tape-worms. If they are now encysted in the muscles of a pig they may easily be introduced into the human body by the flesh of the pig being eaten without being perfectly cooked. In the human stomach the cysts will be dissolved and the worms will reproduce freely, and the young will bore their way into the muscles. The symptoms closely resemble muscular rheumatism. The pain is intense, and unless it is modified in some way the patient is in great danger of dying. Whatever his fate may be, he may have the satisfaction of knowing that the Trichinae are hopelessly side-tracked, and that if his body meets the fate common to humanity, their doom is sealed.

The Oxyurus vermicularis is a round worm, frequently found parasitic in children. The eggs are taken into the body either by drinking impure water or by eating food which is unclean. The eggs hatch in the stomach, but the worms pass on toward the lower portions of the intestine. Here they may occasion more or less trouble until they are expelled, when they quickly lay their numerous eggs and die.

The life history of the Ascaris lumbricoides is very similar to that of the Oxyurus vermicularis, with the exception that the Ascaris spends a comparatively long life in the intestines, and its eggs which are laid frequently are discharged from the alimentary canal. In structure the Ascaris is the larger of the two worms. As the effect of tape-worms and of most round worms varies widely with different individuals, scarcely any two being affected in the same way, and as the symptoms indicating these parasites are obscure at best, we need not be surprised at the quackery which centers around them. In almost any city may be found some "Helminthologist" whose chief claim to public consideration lies in the fact that he is a Mexican or an Indian, even more ignorant of worms than of the human body, were such ignorance possible. I know of no stronger argument to use in urging the importance of everyone having an intelligent conception of the structure of the human body than the fact that the offices of these pretenders are frequently crowded with people who in some lines at any rate, are intelligent.

If any one has any reason to suspect that he is afflicted with any kind of a parasite, the only safe thing to do is to consult an intelligent physician and submit to such treatment as he may deem best.

*TAPEWORMS.

The precise place which tapeworms occupy in Nature is not very well known even at the present time. By most zoologists they are placed in the great class of Vermes or Worms, but this division of the animal kingdom consists of a number of groups so imperfectly related to each other that it is not at all improbable that future zoologists will divide it into two or more co-equal divisions.

As one studies the structure and life history of the tapeworm, one is almost forced to the conclusion that whatever it may be, it certainly is not a worm. It is impossible for us to form any clear conception of the ancestor from which this queer form of life has descended. It has been so modified by its parasitic habits that most of its original structures have disappeared. It is one of the comparatively few animals which are entirely without organs of either offense or defense, and it is also entirely devoid of the power of locomotion. Its digestive system has completely disappeared and in its mature form it is little more than the home of a mass of organs necessary for the reproductive function. Indeed, when its life history is told, one readily sees that if its capacity for reproduction was much less than it is, the race would inevitably perish.

These parasites are usually not so disastrous to their hosts as one might at first suspect, and the popular idea that they consume food to the detriment of the patient is without foundation in fact. Were they so highly injurious as to cause the death of the host they themselves would be involved in ruin. Parasites of this kind tend toward a symbiotic relationship with their host, that is a relationship of mutual helpfulness. So far as the tapeworm is concerned, however, symbiosis has been very imperfectly developed, as we have every reason to believe that it is entirely useless to its host, although as before stated, most forms are not highly destructive.

The life of the tapeworm presents such a cycle that it is by no means easy for one to determine where to begin to tell its story, but as people are best acquainted with it in its adult form, it will perhaps be as well to begin with this period of its life history.

In this stage of its existence, the tapeworm consists of two pretty well defined parts; one of these parts is known as the scolex or head and the other part consists of the proglottides, which are continually

*Jour. A. O. A., Dec., 1918.

mistaken for its body. As a matter of fact, the so-called head represents the entire worm and the proglottides are independent individuals which are budded off from the parent stalk. The proglottides occupy somewhat the same relationship to the scolex that the branches which might be cut from a willow tree to use as cuttings occupy to the tree from which they are derived. The proglottides are continually produced by the scolex and those which are most remote from the scolex are the oldest. These proglottides consist of little more than reproductive units and in each one of them may be found both ovaries and testes. In other words, each proglottid is a hermaphroditic animal.

In some species of tapeworms the proglottides have little or no power of motion. In others, they move with some degree of freedom when they are detached from the chain to which they originally belonged. In all cases, the proglottides discharge their eggs in such a way that there is a possibility of the eggs being swallowed by some other animal, thus the proglottides or the eggs from the proglottides in the alimentary canal of the wolf are discharged in such places that deer or rabbits may inadvertently swallow the eggs when eating grass or herbage. When an herbivorous animal (deer, rabbit, etc.) swallows one or more of these eggs, the egg hatches in its stomach and the resulting worm almost immediately passes through the walls of the stomach into the blood. The blood stream sweeps it to some peripheral part of the body where it leaves the blood vessels through the walls of capillaries and becomes encysted in the muscles or other tissues of its host. In this stage of its development, it is commonly known as a bladder-worm. It gets its name from the fact that attached to the body of worm which is to become the scolex, there is a large bladdery organ which is lost when it passes to a new host. Its passage to a new host is dependent upon the first host being eaten. In other words the rabbit which derived its bladder worms from eggs deposited from the body of the wolf, gives the worm back to the wolf when it, the rabbit, is eaten by the wolf. The bladder worm set free by the digestive fluids in the stomach of the wolf, passes to the intestines and there becomes attached to the wall of the alimentary canal by means of hooks which have developed upon the scolex, and here it rapidly develops into the adult form or the form which produces the proglottides. Thus it will be seen that the tapeworm ordinarily vibrates between two hosts. In the carnivorous host it reaches its highest degree of development and in the herbivorous host it lives as an encysted bladder worm.

It is not easy to determine how many species of tapeworms have been described up to the present time. Owing to individual variation among them, it is not improbable that a single specie has been described under several different names and conversely there are some species which so closely resemble each other that it is not improbable that the same name has been applied to two forms which should bear different names. There are at least six different tapeworms which are known to infest the human body and it is highly probable that this number would be considerably increased if we were to enumerate forms which are occasionally or accidentally present in the body.

One of the tapeworms well known to infest the body is known as the Taenia saginata. This tapeworm is not infrequently at least twenty-five feet in length. The scolex or head is about as large as the head of a medium sized pin. The proglottides of the mature worm are discharged freely from the human body, and when there is a possibility of these being swallowed with the grass eaten by the ox, they readily develop into the embryonic form in his body. The bladder worm of the Taenia saginata forms a cyst not much larger than a pea and as this embryo readily stands a high temperature, it may well happen that the embryo may be introduced into the human alimentary canal when beef is eaten which has not been very thoroughly cooked. The mature form of this tapeworm may live for many years in the human alimentary canal, each year producing hundreds if not thousands of proglottides and each proglottid producing thousands of eggs. It is due to the enormous number of eggs thus produced that the possibility of this worm continuing its life is dependent. The bladder worm form may live for years encysted in the muscles of the ox.

The Taenia solium is a closely related form of tapeworm which spends its larval state in the muscles of the pig. Its life history is almost identical with the Taenia saginata.

The Taenia echinococcus is a near relative of the two preceding worms, but unlike the others it spends its larval stage in the human body. Its mature form is found in the dog, wolf and other closely related carnivorous animals and its ordinary life history leads it through the sheep and ox during its larval period, but owing to the close relationship between the dog and man, it sometimes happens that the human being unwittingly swallows these eggs. The Taenia echinococcus differs from most of its relatives by the larva having the power of reproduction by budding. Owing to this, a single egg may produce a large colony of the larvae and the cyst which forms around this colony may be several inches in diameter. Because of this peculiarity, infection by the Taenia echinococcus is an extremely serious matter and when the cysts occur in the liver, as they not infrequently do, it may lead to early death. It is perhaps needless to say that when the larvae develop in the human body, they are hopelessly sidetracked so far as their own development is concerned, as the dog and wolf can continue the species only as they get the larvae from dead sheep or cattle.

Another member of this genus is the Taenia eliptica, or as it is sometimes called, the Diphilidium caninum. This is one of the smallest tapeworms. Its length varies from five to eight inches and it is one-fourth to one-half of an inch in breadth. This worm normally spends its larval stage in the bodies of dog fleas and its mature stage in the alimentary canal of the dog. As the eggs are discharged from the alimentary canal of the dog, those which happen to adhere to the hairs of the dog's body, may be swallowed by fleas and the flea with the fully developed larva in its body may be swallowed by the dog when the flea causes too much irritation, and thus the cycle is completed. It is easy to see how children playing with cats and dogs infested with these worms may unwittingly swallow the fleas and thus become infected with the mature worm.

One of the most-to-be-dreaded of the tapeworms is the Dibothriocephalus latus. This is sometimes known as the fish tapeworm, as this worm spends its larval life in any one of several species of fish, and in countries where fish are eaten without being thoroughly cooked, the inhabitants are more or less infested with this worm. The Dibothriocephalus produces a severe form of anemia in its human host and it is not easy for the physician to determine the difference between anemia produced by this tapeworm and pernicious anemia. It will be readily seen that it is a matter of real importance to distinguish between these two anemias, as the only treatment which is of any value for the tapeworm anemia is to get rid of the worm. If this is not done, there is at least a possibility that the patient may absolutely die. It is well to remember that most of the cases of infection by this tapeworm come to us from Europe and that infections seldom occur in this country.

Another European tapeworm is the Hymenolepsis nana. This is the baby among the human tapeworms. It is not known that infection ever occurs in this country. The worm in its mature form is only one and one-half inches in length and not more than threequarters of an inch in breadth. Frequently it is very much smaller than either of these dimensions. There are about one hundred and fifty segments in its body and its life history is entirely unknown. Some of its victims manifest no well-defined symptoms, but others seem to suffer seriously from nervous complications.

When one has experience in our larger clinics and notes the considerable number of people who are suffering from this very preventable disorder, he becomes more strongly impressed than ever before with the value, indeed, the absolute necessity of preventive medicine. The methods of prevention are self-suggestive when one knows the life history of these worms. Meat thoroughly cooked and children protected from infested cats and dogs would very soon solve the tapeworm problem.

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*NEMATODE WORMS.

The term of Nematode, which means thread-like, is applied to the round worms. Those which are parasitic in the human body are either thread-like or spindle shape in form, varying in length from less than one millimeter to nearly or quite one meter in length. The outer surface of these worms is either smooth or covered more or less with hairs. Most of them are plainly segmented. The sexes are usually distinct, the male worm being much smaller than the female. The eggs pass from the body of the female before they are developed.

Some parasitic worms pass through a well-marked larval stage, others undergo no particular change of form until they reach maturity. Some of them live independently of a host during a part of their lives, others spend their entire lives in the body of the host and in some cases two hosts are necessary for the complete development of the worm. Some parasitic worms are transferred from one animal to another by means of food or water, others are transferred only as the first host is devoured by the second one.

Of the several round worms no one is more generally discussed at the present time than is the hook-worm. It is now known that this worm is so widely spread and its effects upon the human system are so disastrous, that we believe that we will be pardoned for going somewhat extensively into its distribution and its life history.

The hook-worm is an intestinal worm about one-half of an inch long and is usually found in the upper part of the small intestine to

*Jour. A. O. A., Jan., 1914.

the lining of which it attaches itself, and sucks the blood from neighboring capillaries. Aside from the injury which it does the patient by sucking his blood, it produces a distinct poison which is freely absorbed into the blood and this poison causes more or less of a disorganization of the blood corpuscles.

The worm, which is about as large in diameter as an ordinary pin, varies in color from a whitish yellow to a dark brown or red, dependent upon the amount of blood it has drawn from its host. The male worm is somewhat shorter than the female and its tail is funnel form in shape, while the tail of the female is pointed. Otherwise, the sexes closely resemble each other. The worm has a strong tendency to flex its head upon its body and it is this peculiarity which gives it its name.

The female lays from two to five thousand eggs daily after it reaches maturity. If these are deposited where conditions are favorable the young worms hatch in from twenty-four to thirty-six hours. The most favorable conditions are realized when excreta rich in the eggs of these worms is deposited on moist and sandy ground. The young worms are nourished by the excreta and in about one week are ready to enter the foot or any other part of the human body which may come in contact with the ground. Under favorable conditions the hook worm may live for five or six months in the ground before entering the human body. The worms are usually introduced into the body by the patient either sitting on the ground or standing on the ground with bare feet. A local rash usually appears when the worms enter the flesh. After getting into the blood, they are carried over the body, usually leaving the blood in the lungs; they then pass up through the air passages to the pharynx; from there they are swallowed and thus reach the intestine. It requires nearly three months for them to establish themselves in the intestine after they have entered the body. The local irritation caused by the entrance of the hook worm has been called by various names — ground-itch, dew-itch, dog-itch and cow-itch are some of the names which have been applied to this condition.

The worms were first discovered by an Italian physician in 1843 and it is only recently that they have been known to exist in this country. It is now known that they are widely distributed over the United States. Not only the inhabitants of the Southern States are known to be widely infected, but a number of cases have been reported in Utah, Nevada and California.

The effect produced upon the victim of hook worm infection is most serious. The face usually presents a stupid appearance, the features are expressionless, the pupils of the eye are usually dilated, and inability to see at night is by no means uncommon. The chest is greatly flattened and the scapulae become prominent. Frequently the abdomen is swollen to a marked degree. The appetite is usually poor and more or less perverted. The "dirt-eaters" of the South are brought to this condition by hook worm infection. The depravity of appetite is frequently shown by the excessive use of tobacco and snuff. Girls are injured by hook worms more than boys and their development is frequently greatly delayed by these parasites. The red corpuscles of the blood are frequently reduced to one and one-half millions per cubic millimeter and the hemoglobin often falls below 30 per cent. of what it should be.

It is only necessary to know the life history of the hook worm to know how to prevent infection. All excreta which may contain the eggs of this worm must be carefully kept from the surface of the ground, and if one is obliged to be in regions where hook worms prevail, the feet should always be carefully protected by shoes and one should never sit upon the ground. In other words, with the hook worm danger, as with most other things relating to hygiene, cleanliness and continued cleanliness is the means of protection. The health authorities of the Southern States are carrying on an important campaign of education and undoubtedly much of the poverty of the South will be abolished with the abolition of this disease which so completely unfits its victims for profitable industry.

The diagnosis of hook worm infection can only be made by microscopic examination of fecal matter. At the present time immigrants are carefully examined before being admitted to this country, and if they are found to be the victims of this disease, they are treated before they are allowed to mingle extensively with other people. As before stated, the only real danger from hook worm infection is in those places where little or no attention is paid to the proper care and removal of sewage.

*HOOK WORM DISEASE.

This is one of the very old diseases which have affected humanity. It is said that a reasonably good description of the disease has been deciphered in an ancient Egyptian papyrus. It was described by some of the old Spanish physicians in Brazil as early as 1648, and at the time of our revolutionary war it was recognized as a dangerous disease in tropical countries. It was not, however, until about 1850 that the disease was definitely associated with the hook worm, and it was not until 1893 that the disease was recognized in our country. The first case observed is said to have been in St. Louis.

There are two closely related worms responsible for this disease. One is known as the Necator americanus, and the other as the Ankylostoma duodenale. The specific name of the last species named is indicative of the part of the alimentary canal in which it is frequently found. The disease has received a number of different names: Egyptian chlorosis, Brickmaker's chlorosis, Tunnel anemia, Miner's anemia, being some of the more common names. It will be observed that all of these names associate this disease with the ground. We now know that the disease is very widespread and that its moral and physical effects are disastrous in the extreme. "The poor whites" in the South and the clay eaters of Georgia and Florida have long been objects partly of sympathy and partly of contempt. It is certain that their pitiable condition is due very largely to the parasites which they harbor. The only positive diagnosis of this disease is made by finding the eggs of the worm in the excreta of the patient.

Unlike the eggs of the whipworm (Trichocephalus trichiurus) or the eggs of the Ascaris lumbricoides, the eggs of the hook worm are not stained by bile but present a clear hyaline appearance. When these eggs are carelessly discharged upon the surface of the ground they hatch in from 24 to 48 hours. After hatching they pass through a series of changes requiring about four days, before they are ready to enter the body of the victim. At the end of about four days these changes are completed and whenever they have an opportunity to come in contact with the bare skin they quickly bore their way into the tissues. The result of this is an extreme irritation of the skin, producing what is known as the "ground itch" or dew itch.

After the parasites have entered the body they quickly find their

*Jour. A. O. A., Nov., 1910.

way into the blood stream and when they are carried to the lungs they find their way into the air cells of the lung, from which they gradually work their way into the throat through the trachea, and from here they are swallowed and soon reach their permanent home in the alimentary canal, beyond the stomach.

From what has been said of the hook worm it is evident to us that the careful disposal of excrement from the body is the natural means of protection. If this matter receives proper attention, the spread of the disease becomes an absolute impossibility.

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*TREMATODA OR FLUKES.

The scientific name of this group of parasites (Trematoda) means to bore a hole. The name is used to express the difference in character between these parasites and the Cestodes (Girdles), the latter living outside of the true body substance while the former inhabit some of the organs of the body. Consequently the name Trematoda is rather descriptive of their habits of life.

Few parasites are more widely distributed than the Trematodas and very few have a more complicated and interesting life history. They are found in their mature state not only in a very wide range of mammals but they are also found in many birds and, in some cases at any rate, they inhabit the bodies of invertebrates. To illustrate their peculiar nature, it may be stated that one species has been found only in the frontal sinus of the skunk, while another species is only known to live in the nasal passages of the duck. It is, however, in some of the domestic mammals that the greater part of their disastrous work is done. It is only occasionally that they occur as human parasites, but when they do, the result is usually fatal.

It is by no means unusual for parasites to pass their lives in the bodies of two animals. Among the many cases of this kind may be mentioned the Trypanosome, the various malarial parasites, all of the tapeworms and a number of the round worms, but the flukes add to this complicated existence one more intermediate host. That is, they live in three animals during their life cycle. From the fact that two intermediate hosts are common but not necessary to the life of the

*Jour. A. O. A., March, 1914.

fluke, one may infer that the second host is a comparatively recent modification in the life of the fluke.

As the life history of the sheep fluke has been carefully studied, I select this as a typical form to illustrate the complicated life history of the group. Let us start the history with the mature fluke living in the liver of the sheep. Eggs are laid in large numbers in the biliary passages and these find their way through the various bile channels into the intestine of the sheep. With the general debris of the intestine these eggs are expelled from the body of the sheep. Should they fall upon the dry earth, they soon perish, but if by chance they drop into the water, they soon develop into a free swimming ciliated worm which after living for a short time in the water, enters the body of a snail. Here they reproduce themselves asexually and ultimately cause the death of the snail. If this occurs on the land, the young worms soon perish, but if the body of the dead snail falls into water, it quickly decomposes and the young worms are set free. After enjoying their freedom for a short time, they enter the body of another snail where they again asexually reproduce. This second snail is not as a general thing killed, but it crawls up on the stalks of weeds and herbage growing in the water and there glues itself to the stem of the plant. If by chance, this stem is eaten by a sheep and the snail swallowed, the parasites are set free in the stomach of the sheep after the snail is digested, and quickly passing through the stomach into the upper intestine, they make their way to the liver, there to begin the round of life again.

It is practically certain that it is not absolutely necessary for the fluke to enter the body of its second host and that if the second host is not readily at hand, the free swimming worms at length attach themselves to herbage growing in the water and in this form may be directly taken into the stomach of the sheep and the life cycle may be completed in this way. It is also quite certain that if they should be inadvertently swallowed by a human drinking the water, the person may thus become infected with these most dangerous parasites. For that reason all water to which sheep have access should be regarded with great suspicion.

The life of the fluke in the sheep has been divided into four pretty well defined periods. The first period is that of immigration or entrance to the body. This often occurs in the autumn and it requires from four to thirteen weeks for the fluke to become ensconced in the sheep's liver. During this period the animal seems to suffer very little from its unwelcome guest and ordinarily no change is perceived in its health. This period of immigration is followed by a period of anemia. In Utah, sheep are in the anemic period more often in November and December. If the animals have become fat by this time, the fattening is soon checked and the mucous membranes of the mouth and nose become pale or yellow. The sheep is sluggish in its habits and usually has a marked fever. The feces are normal in appearance but usually contain large numbers of the eggs of the fluke. The anemic period is followed by a period of wasting. This may occur during the month of January. The sheep becomes greatly emaciated, the mucous membrane is greatly blanched, the respiration is quick and labored and the appetite is very irregular. Abortion is very common among the females, and the face, legs, larynx, etc., become greatly edematous. Death is very frequent during this period.

If the animal does not die, it passes on to the period of the emigration of the flukes. This may occur during May and June. For some unknown reason, the flukes frequently leave the liver at this time, pass into the alimentary canal and are voided from the body of the sheep. When this occurs the sheep makes a gradual, but never complete, recovery. The liver heals, but with the formation of a large amount of scar tissue.

These periods are never so well marked in the human being as in the sheep, and yet one who is infected with the fluke worm may pass through all of these stages, recovery not being entirely unknown.

Safety both of the human being and animals demands the one thing which seems to be the basis of all hygiene, and that is cleanliness. Water which is kept entirely free from the possibility of contamination can never become the means of bringing about the infection either of man or beast.

A vast amount of the poor, illogical, morbid, extravagant, pessimistic, insipid thought that finds its way into books and sermons and conversation has its origin in poor bodies and bad health. The body lies at the basis of success in all respects. On the other hand, it is just as true that the mind controls the body. No person can be the victim of base and selfish conduct without his mind reacting unfavorably upon his physical condition; in other words, there seems to be a mutual action and reaction between body and mind. A sound body goes far toward making a sound mind; and a sound mind goes farther than many people realize toward making a healthy and vigorous body.

*POISON OAK.

At this time of the year it does not seem inappropriate to turn aside form the public health problems which are ever before us to one which concerns so many lovers of nature.

Many people who are passionately fond of nature and who enjoy a ramble in the wild woods more than almost anything else, have their pleasure seriously curtailed by a constant fear of being poisoned by poison ivy, poison oak or poison sumach. Dr. Edward Van Adelberg, of Oakland, California, has made a somewhat careful investigation of these plants, and I have thought that I could not render a greater service to the readers of this department than to give them a resume of his investigations, together with some observations which I have personally made.

These poisonous plants belong to the botanical order anacardiaceae, and they are known to the botanists as follows: Poison oak is Rhus diversiloba; poison ivy, Rhus toxicodendron; and the poison sumach, Rhus venenata. This group of plants is widely distributed throughout the United States. The poison ivy ranges from the Atlantic seaboard west to the Missouri River, and in some localities may be found even somewhat further west. It is not known to grow in the Pacific Coast States. In these states, poison oak seems to take its place. The plants closely resemble each other, and anyone but the technical botanist might easily mistake one for the other. The leaves of these plants are very beautiful, whether examined in the early Spring when they are beginning to grow, or in the late Fall when they are dying. The fruit is a berry, and like the blossoms and leaves, is rich in the poison afforded by the plant. The berries lose their poisonous properties when they ripen, so far as birds are concerned, for the birds eagerly eat them, and in this way aid in their distribution.

The poison of these three plants seems to be identical. This was first determined by Dr. Pfaff of Harvard Medical School. Physicians have long recognized that dermatitis caused by the different plants is identical.

Many attempts have been made to chemically isolate the poison from these plants. This work is particularly important because it is the necessary foundation of careful clinical study of the problems involved. So far as is known, a German student by the name of van

*Jour. A. O. A., May, 1918.

Mons first attacked this difficult problem in 1779. His conclusion was that the poison was some kind of a gaseous hydrocarbon which emanated from the plants only at night or on cloudy days. In 1825, Lavini again attacked the problem and concluded that the poison was a gas exhaled at night, but he thought it was not a hydrocarbon. In 1858, the problem was again attacked, and the chemist believed that the poison was due to "rhustannic acid." In 1865 it is recorded that another careful study was made and the conclusion was that toxicodendric acid was the offending agent. In 1882 and 1883, some Japanese chemists made a careful study of this poison, but their results were not satisfactory even to themselves, and it was not until Pfaff, in 1897, attacked the problem that the matter was made at all clear. Pfaff showed that toxicodendric acid is identical with acetic acid, and that the real toxin is really a non-volatile substance. This substance was named toxicodendrol on account of its oily appearance. It was shown that 1/1,000 of a milligram of this substance produces a very typical dermatitis. While all parts of the plant yield toxicodendrol, it is most abundant in the leaves and green berries.

The careful work of Dr. Pfaff was supplemented in 1906 by Dr. W. A. Syme of Johns Hopkins University. Dr. Syme proved that the poison is glucosidal in character, and that it may be decomposed into gallic acid, fisetin and rhamnose. Dr. Syme showed that the poison is non-volatile even when mixed with acetic acid or with alcohol. A glance over this brief history shows that for a period of nearly 120 years the toxin was regarded as volatile, and that it is only during the last ten or fifteen years that it has been proved to be non-volatile. Several careful investigators have believed that the poison was due entirely to bacterial action. We now know that this is not the case, although it is highly probable that the dermatitis produced by the poison is often accompanied by bacterial infection.

While it is now known that the toxic principal is non-volatile, the practical question arises as to how poisoning at a distance from the plant occurs. It is very certain that people may be poisoned without coming into direct contact with the plant. This is probably brought about by the poison being carried by pollen or plant hairs or dust, or people may brush against these plants unconsciously and thus get the poison on their clothing, and this is afterward transmitted to the skin. It has also long been known that the poison is readily transmitted by smoke. Experiments show that the temperature of boiling water is not sufficient to decompose the poison, and when the plant is burned, the poisonous principle is readily carried on particles of soot for considerable distances. There is a popular idea that the poison has a tendency to spread after it has been brought into contact with the body. Careful experimentation fails to confirm this view. The serum from the vesicle produced by the poison appears to be absolutely inert when it is rubbed upon other parts of the body. The so-called "spreading" of the poison is probably due to the fact that on those parts of the body where the skin is thinnest and most sensitive, the dermatitis first appears, and where the skin is thicker, the poison penetrates more slowly, and hence appears at a later time. Nothing is accurately known as to the exact way in which the poisoning takes place. It has been believed by some that under certain circumstances, one may acquire immunity to poisoning by rhus, but experiments do not confirm this view.

Many animals are very susceptible to the poison. Guinea pigs and rabbits usually die if a small amount of the poison is injected into their circulation. Dr. Von Adelung believes that the best means of preventing poisoning is to wash most thoroughly with soap and water after an exposure. He says: "I have frequently protected myself against poisoning, as have others, when not in direct contact with the plant, by simply washing the exposed surfaces within a few hours after exposure, using soap and hot water. When, however, I am to be thoroughly exposed, as in gathering the leaves or handling the dried plants, I prefer the protection of cotton-seed oil on hands, arms and face, gloves, a bath for the whole body as soon after exposure as possible, and a change of clothing."

If one has been exposed to this poison, he should change every article of clothing as soon as possible and use the bath, as already suggested. Clothing which may have come into contact with this plant should not be worn until it has been washed, or if it cannot be washed, it should be sent to the steam cleaner. Experiments show that the dermatitis may be greatly relieved by the use of hot water, ichthyol collodion, potassium permanganate, magnesium sulphate and tincture of iodin.

Every lover of nature should be enough of a botanist to readily recognize these plants, and when they are recognized, one need be in little danger from them if he observes the precautions which have been mentioned.

*INFANTILE PARALYSIS.

This disease was first clearly described in 1840. Previous to that time it was confused with a number of other somewhat similar diseases. It is known to occur in a good many different forms and these different forms are largely determined by the part of the nervous system which is affected. When the disease attacks the bulbar region, it usually runs a very short course and the patient quickly dies.

The mortality ordinarily ranges from 5 to 20 per cent of those attacked, and of those who escape with their lives, 75 per cent are crippled to a greater or less degree.

The greater number of victims of this disease are children between the ages of one and five years, and it is somewhat more common in summer than in winter. The incubation period is believed to range between two and thirty days, and it is believed that the organism producing the disease is especially abundant in nasal and mucous secretions.

The early symptoms of infantile paralysis so closely resemble the early symptoms of other diseases that careful diagnosticians are agreed that it is not safe to recognize the case as infantile paralysis until the paralysis has actually manifested itself. Unfortunately, this precaution is not observed by the ordinary practitioner, and because of this, many cases of intestinal and other diseases are undoubtedly called infantile paralysis. It is unfortunate that snap judgments should thus be passed, as it leads to terrorizing the community, and especially the family of the victim.

It is impossible too strongly to urge physicians to withhold expression of opinions until there is reason to believe that the opinion is well founded. No matter what the disease may be, the physician may observe all precaution necessary in the most serious cases without causing any undue alarm to relatives. If a serious disease then manifests itself, there is still plenty of time to prepare the family for the burden which they will have to bear.

*West. Ost., Aug., 1912.

*MEASLES AND AFTERMATH.

Few people appreciate the real seriousness of an epidemic of measles. The disease is regarded by many as an incident in the life of a child, and as a more or less serious joke if the victim is a grown person. This view is not held by those who are at all familiar with the real nature of the disease.

In and of itself, measles is not, in a large majority of cases, anything particularly serious, but the after effects are far-reaching and these, together with the primary disease, are so serious that students of the history of medicine rank measles third among infectious diseases for causing death.

It is well known to all students of hygiene that any person whose vitality is impaired is much more susceptible to an infectious disease than is a person in robust health. The impairment of the health by some diseases especially lowers the resistance of the body to other diseases. Of the diseases which lower the resistance of the body, measles probably ranks well toward the first. Either the child or the adult who has had measles is especially liable to contract lung disease.

If he takes cold during the time that he has measles or soon after the rash has disappeared, he stands in special danger of pneumonia, and pneumonia following measles is more dangerous than uncomplicated pneumonia. If he escapes pneumonia there is a considerable length of time during which he is particularly susceptible to tubercular infection. This infection is so often insidious and its evidences are so obscure that by the time the disease has fully developed one may almost have forgotten the mild attack of measles which really paved the way for this extremely serious malady.

If one escapes all lung diseases, there is danger that the eyes may seriously suffer. About the only way to protect the eyes after an attack of measles is carefully to avoid strong light and, for some weeks, at any rate, resolutely to refuse to fatigue the eyes by any kind of close work. I know that this may mean that some children will "fail to make their grades," but it is far better that a child should fail to make several grades than that he should suffer all of his life from an unnecessary impairment of his eyesight.

It is most earnestly hoped by all friends of our young people who have been and who are the victims of measles that every care will be

*So. Pas. Rec., Mar., 1910.

taken to avoid the serious after-effects which are so frequently experienced. Intelligent and persistent care between now and the close of our schools in June will not only save thousands of dollars in future doctors' bills, but it will greatly diminish the death rate during the next five years and will add immeasurably to the efficiency of the generations upon whose shoulders the burden of society will so soon fall.

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*MEASLES.

As this disease is widely spread in our city at the present time, a few words in regard to its history and nature may not be out of place in this connection.

For a long time, measles, scarlet fever and small pox were confused with each other. In 1676 a French physician undertook to differentiate scarlet fever from the other two diseases, but it was not until almost the beginning of the last century that small pox and measles were clearly differentiated from each other. The measles appears to have been brought to this country by the early settlers of New England, and it proved singularly fatal to the Indians of that region.

The white man's diseases seem to have been quite as fatal to the New England Indians as were his bullets. Measles did not reach California until 1846. Since then it has spread to all parts of the state.

Uncomplicated measles presents few dangers to the patient, but there is great danger of pneumonia following an attack of measles, and the diseases which immediately follow measles rank third in causing death in the United States. Not only are these diseases to be avoided, but it must be remembered that the eyes are usually left in a much weakened condition following measles, and great care must be taken to save them from serious injury. It often happens that children are kept in very badly ventilated rooms in the effort to keep them from strong light. It is much better to protect the eyes by dark colored glasses and then allow plenty of sunshine and fresh air in the sick room.

Few diseases are more contagious than measles, and great care should be exercised to keep those who are in a low state of vitality from contracting the disease.

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*So. Pas. Rec., June, 1913.

*PELLAGRA.

Pellagra, so far as the name is concerned, is a new disease in the United States. It is by no means improbable that it has existed here for a long time, but until recently no positive diagnosis of the disease had been made.

It is pre-eminently a disease of Southern France, considerable parts of Italy, Switzerland, and the land through which the Danube flows.

The symptoms of pellagra in its early stages are exceedingly vague. The patient may suffer more or less from headache, insomnia, and illy defined digestive troubles. At a later time the skin becomes rough, presenting many of the appearances of eczema. Occasionally pus forms under the hard rough scales of the skin. If the disease progresses toward its most serious stages, the patient has marked mental troubles, sometimes a well-developed suicidal mania, and he may suffer from severe spasms and partial paralysis.

A disease whose results are serious as are those of pellagra is one which should be most carefully studied and one from which we should protect ourselves by every known method of prophylaxis. All intelligent prophylaxis must, of course, be based upon a knowledge of the disease, and at the present time our knowledge of the disease is very slight.

Those who have studied pellagra most carefully are divided in opinion as to whether it is a constitutional disease or a disease due to an infection. Those who incline to regard it as a disease due to infection are divided in opinion as to whether the infection is bacterial or protozoan. Almost all careful students of the disease are of the opinion that it is due in some way to the use of a low grade of Indian corn. The only marked exception to this view is to be found among French physicians.

In controversial literature upon this subject, those who hold that there is a close connection between Pellagra and spoiled corn are known as Zeists; those who hold the opposite views, viz., that corn is not in any way connected with the disease, are known as Anti-Zeists (the term Zeist is derived from the scientific name of corn—Zea maize) ; those who hold that the disease is due to corn are again divided among themselves in opinion, some holding that the corn has undergone some vital change which makes it a poison. Those who hold this view, point to the well-

*West. Ost., Jan., 1910.

known fact that if the potato grows partially exposed to the sun, a distinct poison develops in it. Others hold that where corn is used extensively as a food, the process of digestion leads to the formation of poisonous products producing one form of auto-intoxication. Another group of the Zeists hold that poison may have been developed in the corn by either bacterial action, the growth of molds, or the development of some protozoan animal. It certainly seems that in some way the disease is not only connected with corn, but, as before stated, with corn which has undergone some kind of decomposition.

It is, of course, possible that we shall eventually find that the relationship between Pellagra and corn is in some respects like the relationship between malaria and mosquitoes.

The question continually arises as to whether or not Pellagra is a communicable disease. The best authorities believe that Pellagra is not transmitted directly from one person to another. In this respect is it quite comparable with malaria.

Roussell, a French physician who has made a most careful study of Pellagra, says: "Although the hypothesis of a pellagras virus has had a place in the discussions of the last century, and has even appeared in divers authorities of our own time, it has seemed to me useless to try to refute it. It can be said of the contagion of Pellagra that it is a question fully determined. . . . Pellagra is not contagious."

Procopiu says: "The disease is not contagious, and the sick may associate intimately and freely with the well; and if spoiled maize is not eaten, the disease does not occur."

Mr. Cutter, who is not a physician, but was a most careful student of the disease in Italy, says: "Pellagra is neither infectious nor contagious. It is transmissible like insanity in the form of a previous disposition."

It is needless to say that these views may be somewhat modified by further study.

The first national conference on Pellagra held in the United States convened at Columbia, South Carolina, on November 3d and 4th, 1909. There were 350 delegates, representing most of the eastern and southern states. The papers presented at this conference were of far-reaching interest and importance, and it has stimulated such interest in the subject that we may expect our knowledge of Pellagra to be vastly increased in the immediate future.

*HYDROPHOBIA.

Few diseases bring more terror to the ordinary individual than hydrophobia. Part of this is due to the really serious nature of the disease and a part to the mystery which surrounds it.

It is a disease which is very rarely transmitted from one person to another, but is almost invariably acquired from the bite of some animal suffering from the disease. Statistics indicate that the disease is more frequently contracted from the cat than from any other animal. The number of cases, however, contracted from dogs very nearly approaches the number contracted from the former animal.

The disease is apparently of world-wide distribution. It is very common in Russia, rare in northern Germany, common in southern Germany and France and, at the present time, almost unknown in England. In many parts of the United States it is unfortunately comparatively common. In all of the countries where it is common little or no attention is paid to the health or habits of domestic animals. In England where the disease is practically unknown, domestic animals receive the most careful attention and dogs running at large are always muzzled so that they may not endanger other dogs or human beings with whom they come in contact.

When a person or animal is bitten by a dog or cat suffering from the disease it is by no means certain that he will become infected. Statistics indicate that only about 15 per cent of the persons bitten by rabid dogs contract the disease. When the bite is on the face or hands or some exposed portion of the body infection is much more likely to occur than when the person is bitten through clothing.

When a person is infected a considerable period of time, varying from two weeks to as many months, will elapse before any symptoms of the disease manifest themselves. The time elapsing between the time of infection and the appearance of the disease is known as the incubation period. In young people the incubation period is somewhat shorter than for older people.

It is observed that punctured wounds, such as might result from the snap of a dog, are more dangerous than lacerated wounds. When a person contracts the disease the first symptoms usually manifest themselves in the form of mental depression, sleeplessness, irritable temper and headache. This stage is quickly followed by a highly excitable

*So. Pas. Record, Dec., 1909.

condition of the nervous system. In this stage a bright light or sudden noise may throw the person into convulsions. The same is true when one attempts to swallow water; hence the popular name of the disease, which really means "afraid of water." The state of excitement and irritability is followed by a state of extreme depression and paralysis and it is in this state that the victim usually dies.

It is a matter of great importance to know that there is a not uncommon disease known as pseudo, or false hydrophobia, which is a hysterical condition closely simulating the real disease. It will be noted that the premonitory symptoms of hydrophobia—depression, sleeplessness, headache, irritability—are conditions which not infrequently follow even mild dissipation, and a person who is conscious of having been bitten by a dog or cat and who has these symptoms from a totally different cause, is in danger of allowing his fears to so prey upon his mind that he will force himself through the several stages of hydrophobia, even up to the point of actually dying. Surely these are conditions where the experience of Job is repeated—"The evil which I feared hath come upon me."

There is a popular idea that people suffering from hydrophobia have a tendency to bark and snap at those around them; in short, that they display the symptoms of a dog suffering from the disease. This belief is entirely without foundation. The belief is, however, so deeply grounded in the popular mind that the person suffering from hysterical hydrophobia goes through the various actions of a dog because he supposes that he absolutely has to do so. This is at least one means by which the intelligent and careful physician may be able to distinguish between the true and the false forms of hydrophobia.

There seems to be no doubt of our having infected dogs among us and the only rational thing to do is to immediately protect ourselves from them. Every dog, for the safety of the people at large as well as for the safety of his fellow dogs, should be at once muzzled. This does not necessitate any inhumanity, nor even any serious inconvenience to the dog. But if this is done, it will positively and unquestionably protect us from a real danger by which we are menaced. It is needless to say that when this is done we should, so far as possible, cease discussing our danger and use all intelligent means to remove needless fears from children and hysterical people in general. In an intelligent community no one should be exposed to unnecessary danger, nor should people allow themselves to impair their own usefulness or the usefulness of others by yielding to unnecessary fear.

*HYDROPHOBIA.

The dog which was shot last week did not have hydrophobia, as was generally supposed. I secured the head of the dog the same evening that it was shot and spent the greater part of the next day making a careful examination of its brain. I was unable to find any evidence whatever that the dog was affected with rabies, or as it is popularly termed, hydrophobia.

As we frequently read of examinations of this kind being made, it has occurred to me that a brief explanation of how an examination of this character is made might not be without interest to our people. Rabies is a disease caused by an animal parasite which lives in the brain cells of the afflicted person or animal. This parasite is of course microscopical in size and is itself a minute animal instead of being a minute plant. Minute vegetable forms which cause disease are known as microbes; minute animal forms which cause disease belong to a group of animals known as the protozoa. Most of the disease-producing microbes and protozoans are carried over the body of the patient in the blood, but a few of them, and the organism producing hydrophobia is one of these, reach their final destination in the nerve cell by traveling over the nerve fibers. This explains why it is that the person or animal infected by hydrophobia requires so long a time to give positive evidence of having the disease. The time elapsing between an infection and a manifestation of the disease is known as the latent period. During the latent period of hydrophobia the animal organism causing the disease is slowly moving up the nerves of the part of the body bitten towards the nerve cells of the spinal cord and the brain, and it is not until they reach the nerve cells of these organs that the disease manifests itself.

These organisms cannot be seen under ordinary circumstances in the nerve cell. In order that they may be seen it is necessary to crush the nerve substance and smear it over a piece of glass. After the smear becomes perfectly dry it is first acted upon by a solution of picric acid in wood alcohol. After being acted upon by this for three or four minutes the solution is poured off and the slide is again dried under a blotting paper and the smear is then stained with two coal tar products which are known as Fuchsin and Methylene Blue. After being exposed for two or three minutes to this stain the stain is washed off and the specimen is then examined under the high power of the microscope.

*So. Pas. Rec., Sept., 1910.

If the animal has hydrophobia there is always a possibility of finding the microscopic organism inside of the nerve cells thus prepared. If they are found the organisms will appear as bright red dots in the bluely stained nerve cell. It is perhaps needless to say that considerable experience in this line of work is necessary to make one's observations of any particular value.

In the case of this particular dog, I prepared eighteen separate slides and probably examined no less than from 125 to 150 separate nerve cells. In none of these did I find the Negri bodies; as these parasites are called. It is only proper to say that a failure to find the Negri bodies does not by any means prove that the dog has not hydrophobia, but it is strong presumptive evidence that he has not, and the greater the number of nerve cells studied without finding them, the greater is the presumption that the dog is not affected.

Although hydrophobia has been recognized as a disease for nearly twenty-five hundred years, there are still many intelligent people who do not believe that any such disease exists. One reason for this skepticism is undoubtedly based upon the fact that there is a peculiar mental condition known as pseudo-hydrophobia in which the victim has many of the symptoms of the disease without having the disease at all. Pseudo-hydrophobia is undoubtedly one form of hysteria and comes from an abnormal fear of the disease. While there is no doubt that such a disease as hydrophobia exists, and while it is not easy to over-estimate the horrors of the disease, the fact still remains that a comparatively small number of people suffer from it even if they are bitten by a dog that is unquestionably affected by it. There are probably several reasons for this, one being that if the dog bites through clothing these organisms which may be in the saliva of the dog are quite likely to be wiped off on the clothing. Another is that if the wound made by the dog bleeds freely the organisms are likely to be washed out by the blood. Another is that even if the organisms are left in the tissue of the victim's body, they may not come in contact with nerve endings and so they have no road over which they may travel to the spinal cord or brain.

Good judgment on the part of the people of a community is manifested in first reducing the number of dogs to a minimum. Before any person in a modern city possesses himself of a dog he should fully satisfy himself of his need for the animal; next, as soon as a dog shows any symptoms of disease, he should be confined until he is fully recovered. Having taken all of the precautions which can be taken, people should never permit themselves to become the victims of fear. If one is bitten by a suspicious dog he should secure free bleeding from the wound as quickly as possible. He should consult with those who know the most in regard to such further treatment as may be necessary; then he should interest himself in his business and dismiss all fear from his mind. If this does not protect him from hydrophobia it will at least protect him from the false form of the disease.

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*HYDROPHOBIA.

Los Angeles is having something of a flurry of rabies, or hydrophobia. Two or three deaths have recently occurred in the city, said to be due to this disease. The fact that such a disease exists has been questioned by some writers, but we believe its existence is as well established as anything can be. It does not necessarily follow that every dog that is sick or that is out of sorts or cross is the victim of hydrophobia, but ordinary precaution indicates that a dog of that kind shall not be permitted to run at large, and that he shall be most closely watched until his condition can be definitely ascertained.

Different as are the symptoms of rabies and tetanus, it is nevertheless true that some physicians who should have known better have mistaken one for the other. Every physician in the state should be keenly alive to the importance of an early recognition of these somewhat rare diseases, and everyone should inform himself of the proper thing to do should one of these cases come under his treatment.

A dog suspected of this disease should never be immediately killed, but he should be securely confined and closely watched. If he recovers all thoughts of hydrophobia may be dismissed; if, on the other hand, he dies, and especially if he exhibits severe nervous symptoms, his brain should be immediately submitted to a competent pathologist for examination. Unless there is reason for doing otherwise, the best thing to do is to send the dog's head packed in ice, to the director of the State Hygienic Laboratory at Berkeley. No physician in this age can offer any valid excuse to the public for failing to take necessary precautions with this dreadful malady.

*West. Ost., Sept., 1911.

*TYPHOID FEVER.

As we are entering upon that season of the year when cases of typhoid fever are most likely to occur, a few words on the subject may not be out of place.

Like diphtheria, typhoid fever results from infection by a special microscopical organism. The organism which produces typhoid fever is the bacillus typhosus, and it is almost invariably introduced into the body with either food or drink. In a majority of cases typhoid fever is acquired from water in which the bacillus is living. Any water which is contaminated by excrement of any kind is liable to carry this infection. While poor ventilation and many kinds of filth will not cause typhoid fever, they may, by lowering the general vitality of the patient, make him much more susceptible to the disease. A noted physician has called our attention to the frequency with which the disease is spread by "fingers, food, and flies." Fingers, because they may become contaminated from the secretions and excretions of the patient's body, flies, because they quickly visit excretions which may be rich in bacilli, and food because the flies with bacilli hanging to them, crawl over the food, leaving the bacilli in their wake. The bacillus typhosus lives in water for an indefinite length of time, sometimes for weeks. If water containing these bacilli is frozen to ice they are not destroyed, and when the ice is used the water from it is a source of danger. Raw vegetables are also dangerous when they have been irrigated by water containing the bacilli. For this reason it is exceedingly dangerous to use raw vegetables which have been raised by sewage irrigation.

All cases of fever at this time of the year should receive careful attention, and it is well to remember that it is no easy matter for the most competent physician to recognize typhoid in its early stages. During the progress of the disease the utmost care should be taken to disinfect everything which comes in immediate contact with the patient. All excretions from the body should be carefully guarded from flies and immediately disinfected, and after the patient's recovery ordinary prudence requires that the room in which the patient has been, be thoroughly disinfected.

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*So. Pasadenan, Nov., 1907.

*TUBERCULOSIS.

The almost world-wide movement looking to the stamping out of tuberculosis is increasing in general interest rather than decreasing. Reports of consuls from all foreign countries indicate that vigorous steps are being taken for its suppression. These three statements are being kept clearly before the people of all civilized countries: "Tuberculosis is a preventable disease." "Tuberculosis is a curable disease." "Tuberculosis is a contagious disease."

So much has been said in regard to all of these propositions that it really seems there is little left to say which is new, but the relationship between tobacco and tuberculosis has not, so far as I know, been discussed. I was led to think along this line last summer and as a means of information I made bacteriological examinations of sputum collected from the cuspidors of hotels. In several of these specimens I found the bacilli of tuberculosis. As a considerable amount of the material intended for the cuspidor frequently goes onto the floor or drops over the side of the unclean utensil, it is easy to see the danger of infection from this source.

The almost universal demand for the cuspidor is based upon the almost universal habit among men of using tobacco. I know that one treads upon rather dangerous ground when he ventures to condemn a habit that is so universal. I know that it is a great deal safer for the average minister to preach against the sin of worshiping idols in Burmah than it is to condemn the use of California wine. But sometimes there is no harm in raising one's voice against an evil even if that evil is wide-spread and is close at home.

When one has said all that he can justly say about the evil effects of tobacco upon the individual he has not pointed out one of the most serious evils from its use, and that is that it is at least indirectly the means of spreading tuberculosis. If we should do away with the use of tobacco we would do away with the only excuse for expectoration in public. Might it not be well for the physician who is bound by the most sacred obligations to care for public health to give this matter a little serious consideration? In a very low, mild and tremulous voice I would like to inquire if this is not specially worthy of the attention of that special branch of physicians who are justly and conscientiously filled with fear and horror of the evil effects of drugs?

Much of the fear of tuberculosis in the popular mind is without

*West. Ost., Sept., 1910.

rational foundation. No one should underestimate the danger of a tubercular person living in a house, but on the other hand it is very certain that a house in which a tubercular patient has lived, or died for that matter, may be made perfectly safe by proper fumigation.

The best method of fumigation that I know of is the formalin one. Take from one and one-half to two pounds of formalin for each one thousand feet of space. Place this in a large tub and when the doors and windows of the room or house are properly closed, add about seven ounces of potassium permanganate to each pound of formalin. This will produce a rapid liberation of formaldehyde gas. The room or house should remain unopened for from twelve to twenty-four hours, the latter length of time being preferable. I find it better not to closely cork the windows as by doing this the window cracks are protected from the effects of the formaldehyde gas, and when the quantity of formalin is used which I have suggested enough remains in an ordinary tight room to secure its thorough disinfection and that which escapes round the window disinfects the window cracks.

A physician should not only make a general study of this disease, but he should make a careful individual study of every patient so that he may advise him in such a way as to secure not only his own restoration to health when that is possible, but also so that he may not be a source of danger to those with whom he comes in contact.

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*TUBERCULOSIS.

We herewith present a few important facts relating to tuberculosis which cannot be too widely known:

1. Tuberculosis can be prevented.
2. Tuberculosis can be cured.
3. Tuberculosis is communicable.
4. Tuberculosis is not inherited.

To fully protect others the patient should:

1. Burn all his sputum.
2. Use separate eating utensils.
3. Never allow another to use his napkin.
4. Sleep alone.
5. Keep his face and hands clean.
6. Use long sheets for his bed and have them washed frequently.

*Printed for Health Office use; also in So. Pas. Rec., Jan., 1914.

To fully protect himself the patient should:

1. Never swallow his own sputum.
2. Never use a handkerchief to wipe sputum.
3. Sleep as nearly outdoors as possible.
4. Work only in the open air.
5. Eat the most nourishing food.
6. Rest when weary.
7. Avoid all alcoholic drinks and tobacco.
8. Keep out of all dust.
9. Remember that patent medicines are of little or no value and are frequently injurious.
10. Consult the best physician you can, and conscientiously follow his advice.
11. Wear no mustache or beard, especially around the mouth.

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*ONE-FOOT SKATING.

In the *Record* of October twenty-second a very timely article on one-foot skating was printed. I believe that all of the dangers pointed out in that article exist, but there is perhaps one more serious than those mentioned, and that is the danger of seriously deforming the pelvis and interfering with its normal relationship to the spinal column. No physiological truth seems more certain than the one that normal structure is necessary to health. One need not possess much knowledge of the body to realize that when the whole weight comes upon one foot when the body is curved as it is to secure an equilibrium while skating, the result must be a more or less serious deformity of young and growing boys. Rheumatism and serious disorders of the nervous system are very likely to follow this practice. The evil results may not be immediately felt, but they will come none the less certainly. We have no duty more important than that of furnishing good normal and consequently valuable citizens to the next generation. This duty is partially met by our earnest efforts to aid the young in reaching adult life in a high state of physical efficiency.

*So. Pas. Rec., Nov., 1908.

*BUBONIC PLAGUE.

The Bubonic plague, as is generally known, is a highly contagious disease, due to infection by a specific bacillus. The bacillus is commonly introduced into the body through the skin. This introduction may be through even a microscopical abrasion of the skin, or it may be introduced by the bites of flies, fleas, and possibly other insects. The bacillus may also be introduced into the body with either food or drink. Rats, mice and ground squirrels are especially liable to the disease, and in these animals the disease may become chronic, that is, the animal may live for a long period of time, after contracting the disease, and be able to transmit the disease to other animals or to persons. It is believed that the disease may be spread either by flies or fleas as both of these insects may be found upon rats which suffer from the affliction, and both are known to be subject to the disease. Since rats and mice are so especially subject to the disease and since they come in such close contact with people it is especially desirable at this time that they be as thoroughly and completely destroyed as possible. The best way to destroy both rats and mice is to destroy the places where they live, and the best means of accomplishing this end is to clean up filth every where it may be found.

I am satisfied that one of our most prolific sources of rats is to be found in our garbage holes. In these there is almost inexhaustable amount of food for both rats and mice, and as long as we furnish such an abundant food supply extermination will be by no means easy. Our danger from Bubonic plague is very slight, but a slight danger does exist. Any person who visits a seaport town may contract the disease, and if the nature of the disease is not immediately recognized this would easily be transmitted to rats and mice in the house and from these the disease might be transmitted to other rats and mice and in this way the plague might spread in a town as seemingly remote from danger as South Pasadena.

Dr. Foster urged very strongly upon the health officers the desirability of encouraging a campaign against rats and mice in every place. It is evidently the intention of the State Board to prevent the introduction of the plague into Southern California, and it is needless to say that we who live in this part of the State sympathize with the State Board in their anxiety on our behalf. Aside from the war

*So. Pasadenan, Dec., 1907.

of destruction which he urged upon the rats and mice, Dr. Foster advised that every means known should be taken to destroy flies.

It may not be out of place to say that while cats should be encouraged at this time because of their destruction of mice, they should, however, be kept at a distance from children, as cats are occasionally afflicted with the plague. The State Board directs that the local health officer, by personal examination of each dead body, satisfy himself as to whether or not the person could have died from Bubonic plague, and the Board also directs that a post mortem examination be held upon the body of every person who dies suddenly from pneumonia, typhoid fever, uremia, or any other disease whose outset was quickly followed by fatal termination.

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*BUBONIC PLAGUE.

We read with deep sorrow the awful suffering which the Bubonic plague is inflicting upon the inhabitants of Manchuria. According to statements which we regard as perfectly trustworthy, thousands of people are dying every day, and hundreds of thousands are starving and must continue to starve until the next harvest.

Most of the civilized races of the world are beginning to bestir themselves in behalf of these unfortunate people. We are glad to know that the United States is likely to do its full share in the good work.

The present epidemic began in 1894, some seventeen years ago. At that time it was most violent in some of the western provinces of China and India. It is estimated that no less than 6,000,000 people lost their lives in the latter country.

It appears to be a perfectly well-established fact that the Bubonic plague is primarily a disease of rodent animals, and that it spreads to the human being through the agency of fleas and perhaps other parasitic insects. Understanding its nature as we do, there seems little reason why it should ever gain a serious foothold in our country, but eternal vigilance is the price of safety. It is certainly regrettable that a small school of political physicians should undertake to use common scientific information as a means of advancing their own selfish ends. The nature of the Bubonic plague and the means of controlling it are scientific questions, and this scientific information is the property of the world, not of any one system of therapy.

*West. Ost., March, 1911.

*BUBONIC PLAGUE.

If the average American could see himself as he is seen by others, he would either laugh or cry. One of the things which would excite either his mirth or his grief is the spasmodic way in which he devotes his attention to the things which excite his interest. Some of us remember that when Admiral Dewey was returning to this country after the battle of Manila Bay, almost the only question which occupied our thought was what on earth we could do to show our gratitude to the Admiral. For a few weeks nothing on earth which he could have wanted would have been denied him, but very soon after he got home our attention was turned in some other direction, and the Admiral received scant attention.

We in California have acted in somewhat the same way in regard to the Bubonic plague. Fifteen months ago it was an easy matter to go before any city council and secure an appropriation which made it possible to fight and exterminate rats and squirrels. During the past six months few or no cases of Bubonic plague have been reported, and we have sunk into a condition of almost complete apathy. While it is possible that at one time we were too much excited, it is very certain that we now give the matter too little consideration.

Aside from the danger of spreading the plague, the rats and squirrels of the United States levy upon us a tax that is absolutely appalling. Careful statistics, extending over several years of time, show that in the cities of over one hundred thousand inhabitants in the United States, there is a direct loss of at least $20,000,000 a year due to rats. It is probable that twice this sum would be required to represent the loss inflicted by rats and squirrels in the smaller towns and in the country in general. Even if rats presented no menace to public health, the loss they inflict is so great that we should never rest until they are exterminated. It is not at all improbable that the indirect loss caused by rats through the fires they originate, wood work which they destroy, etc., is equal, and perhaps more than equal, to the direct loss occasioned by them.

There seems to be no reasonable doubt that rats and squirrels perpetuate Bubonic plague more than all other causes combined. It is now quite certain that Bubonic plague is seldom if ever transmitted directly from one person to another. When several persons in the

*West. Ost., Nov., 1909.

same house are afflicted with the plague, it simply means that they have contracted it from the same source.

Rats and squirrels are particularly subject to this disease, and they may have it in either the acute or the chronic form. When they have it in the acute form they quickly perish, but when they have it in the chronic form they may live for weeks and even months, but wherever they go the pus which may drop from abscesses is a means of spreading the disease. Probably in the great majority of cases the disease is communicated to human beings by means of fleas which live on the rats, and which become infected from them. While these fleas do not permanently live on human beings, it is known that they may temporarily take up their abode in our clothing and on our bodies. The family cat may occasionally be the means of communication between the rat and the person.

Filth, bad drainage, poor ventilation, unsanitary conditions generally, need unsparing condemnation, but these things are never the means of originating plague, only as all of these conditions are favorable for the presence and further increase of rats.

Unless one has made a special study of the matter he is not likely to clearly estimate the rapidity with which rats reproduce themselves. Under favorable conditions from six to eight litters may be born during each year and the number of young range from two or three to a dozen. Under conditions favorable to them, rats begin to breed when not more than three months old. These facts plainly indicate the importance which should be attached to killing every rat which one can. Owing, however, to the extreme rapidity with which rats reproduce themselves, destroying them either by traps or poisons, dogs or cats, is not the best way to combat them. Like all other animals, their existence is dependent upon food, and if we can keep food away from them it is evident that they cannot remain long in such surroundings. Attention should be as thoroughly directed to making houses rat proof as to securing good ventilation and proper plumbing. From a standpoint of dollars and cents, barns should be constructed in such a way that rats cannot live in them. Board sidewalks in cities should never be permitted and public encouragement should be given all classes of people to absolutely annihilate the rat and to reduce the number of squirrels to the lowest possible number.

If physicians will interest themselves in disseminating information of this character they can go far towards bringing about the great need which confronts us of good public sanitation.

*RATS AND PUBLIC HYGIENE.

The development of the science of bacteriology has profoundly modified our ideas in regard to the origin, cause and distribution of disease. It is to this science that we owe our knowledge of the methods of contagion. No longer do we regard most diseases as due to atmospheric conditions; we no longer think of soil itself as being a cause of disease; and since the science of bacteriology has been developed we have relieved the Creator of capricious responsibility.

Educated people are becoming more and more impressed with the importance of accurate knowledge in regard to the relationship existing between living things. Increased knowledge of the habits and relationship of the mosquito has not only failed to make its bites more endurable, but it has shown us that the blood sucking habits of the mosquito constitute not the least reason for our objecting to that insect. We have learned that it is a carrier of several forms of malaria, of dengue, filariasis, yellow fever, and perhaps several other diseases of most serious character.

Rats are not only highly destructive and offensive in many common ways, but they are also the carriers of Bubonic plague and possibly other serious diseases. The connection between rodents and the plague is a fact which seems to have long been known more or less clearly. If one will take the trouble to read the sixth chapter of the First Book of Samuel he will find that even at that early day the people attributed a serious pestilence which afflicted them to the presence of mice. It is quite possible that the word mouse might as well have been translated to read "rat" or "squirrel."

In the great plagues of the Middle Ages more than one shrewd observer recorded the fact that rats suffered from the disease quite as much as did people. The origin of our common rat is wrapped in obscurity. It is quite probable that it originated in India. Its presence in Europe is not clearly stated until about the time of the Crusades. It is possible that the rat was brought by the Crusaders from the East. Owing to the extent of modern commerce it has now become almost or quite world-wide in its distribution. There are few places in either North or South America which are not seriously infected with them. Wherever they are found they cause great destruction of property. It would be a manifest impossibility to estimate

*West. Ost., Nov., 1910.

with any degree of accuracy the damage done by them in the United States, but it would certainly run far up into the millions each year. The United States Biological Survey estimates the yearly destruction of property as being between thirty-five and fifty millions of dollars.

Rats, and a number of other rodents, are subject to an epizootic which is highly destructive to them and which when communicated to men is called the Bubonic plague. Until the present world-wide epidemic of plague was recognized interest in rats was largely economical, but since the plague has passed to almost every civilized country and since this widespread disease is clearly traceable to the spread of rats, our interest in them is now very much more from the hygienic side than from the economical side.

The United States Marine Hospital Service is doing splendid work not only in preventing the spread of diseased rats, but in adding to our knowledge of the relationship between these animals and human disease. Agents of the Marine Hospital Service are found in almost every port from which goods are shipped to the United States, and great care is taken to prevent rats being transported with merchandise. Foreign countries are awakening to the importance of rat destruction. Denmark, Holland and England are especially active along these lines. In these countries the fear of trichinosis is quite as great as the fear of Bubonic plague, and this fear leads to the destruction of rats in inland cities as well as seaports.

The Pacific Coast is a particularly favorable locality for rodents of all kinds and if our rats or squirrels should become widely infected with Bubonic plague it would be a task of no ordinary magnitude to rid the country of them.

The marmots of India, animals rather closely related to the rats, are infected with the plague in a chronic form. In this form it is not necessarily fatal to the animal, but is readily transmitted to others, and when communicated to the human being may result in plague of the worst form.

If we wish to escape a similar danger now is our time to reduce rats and squirrels in numbers. Every city should be surrounded by a wide zone entirely free from these animals. It is safe to say that none of the small rodents are of the slightest economical importance and that every one of them is more or less of a menace to human health and development.

*SEWAGE IN CALIFORNIA.

The disposal of sewage is a vital question in our State at the present time. The public at large has come to understand so well the dangers from refuse matter that small towns which years ago would never have thought of a sewage system are now introducing them, and smaller towns all over the State are cheerfully bonding themselves to provide a proper sewer system.

Much of the objection to cesspools is, in my judgment, ill-founded. The idea that the ground becomes polluted to such an extent as to make it dangerous is, in my judgment, hardly borne out by the facts. There are, as I understand it, two serious objections to cesspools. The first is that a cesspool is always in danger of overflowing. How nearly full a cesspool may be and when it will begin to overflow are questions impossible to answer. It is certainly true that when a cesspool does overflow it becomes at once a menace, not only to the persons upon whose lot it exists, but to persons living in the immediate neighborhood. The second objection to the cesspool is that it represents an unnecessary and inexcusable waste of water. There is very little level land in California which cannot be made highly productive if it is properly supplied with water, and much of the water which is used for household purposes is just as good for irrigation as water from the mountain streams.

The objection to using sewage for irrigation purposes is founded upon conditions which existed years ago, when methods by means of which injurious bacteria in sewage could be destroyed were unknown. At the present time the well constructed, well managed septic tank has solved the problem along this line, and it is now possible to purify sewage to such an extent that it becomes absolutely innocuous, and of course in this condition it may be used for irrigating crops of any kind. I believe it is most wasteful for the larger and smaller cities to pump their sewage into the ocean. In every case I believe that it should pass through septic tanks until it is thoroughly purified and then be pumped or otherwise distributed for irrigation purposes. By doing this we would vastly increase our irrigation water and correspondingly increase the productiveness of the State. Every physician, as well as every other person who is interested in public matters,

*West. Ost., May, 1911.

should make himself acquainted with the modern septic tank and its possibilities.

The theory of the septic tank is founded upon the fact that bacteria increase in enormous numbers in the presence of a suitable food supply when the temperature is favorable for their development. All of these conditions are met in the septic tank. The sewage which enters the septic tank is already bountifully supplied with bacteria, but in the presence of the great amount of organic matter in the sewage and at the warm temperature at which the sewage is maintained they increase with almost incredible rapidity. Of course, to do this they have to use an immense amount of food material, and as the supply of sewage is shut off from the tank during the time of fermentation it follows that the organic matter in the sewage is quickly destroyed and the bacteria perish. Thus the sewage is rendered sterile and in this form may be safely used for almost any purpose. The principle of the septic tank is closely comparable with the condition of an iron warehouse in which there is a great quantity of grain and water stored, conditions which would be highly favorable for rats or mice. If a few of these animals are present, it is easy to see that they might rapidly increase in numbers in the presence of the abundant food supply, but if no more grain were added the rapid increase of the animals would only mean hastening the time when they must starve to death.

A septic tank properly constructed and managed is not seriously offensive so far as smell is concerned and there is no danger from its bacterial content. Certainly this method of disposing of sewage will make possible a sewerage system in inland towns from which the drainage of sewage would be absolutely impossible.

Just now we are all deeply interested in regard to the real truth about many new methods of treating disease. We know that there are great monetary interests behind these. To what extent many honest physicians are mistaken in regard to the supposed results we do not know at this time, but if we shall ultimately find that the effects of these things are radically different from what is popularly believed we would only be in strict harmony with previous experiences through which people have passed.

*HEALTH AUTHORITY AGAINST CESSPOOLS.

The evils of sickness constitute the most grievous tax which any community can be called upon to pay. No tax collector is more absolutely heartless and relentless than disease. This stern agent is absolutely without sympathy and remorselessly exacts his dues to the uttermost.

There is no cause of disease which confronts our city at the present time which is so dangerous to us as our cesspools. So long as there are no wells in the city and so long as the cesspools are well drained, they constitute an unobjectionable method of disposing of sewage, but the evil of the cesspool is that it becomes filled at the most unexpected moment and then its contents are spread over the surface of the land and in that way become extremely dangerous. Experience, not only here but elsewhere, has conclusively shown that cesspools are seldom replaced until they have become full and run over and then no matter how vigilant the owners finally may be in having a new cesspool dug, the old one continues for a number of days to menace not only the health of the family to whom it belongs, but also the health of the neighborhood.

Not only are cesspools dangerous because of the certainty of their continually filling, but they are also expensive for the same reason. From the mere standpoint of dollars and cents, sewers are in the long run cheaper than cesspools. A proper sewage system once installed settles the problem of sewage for all time, while as before stated the best constructed cesspool is only a makeshift and must be in a short time replaced by another.

There is no finer example in the world of the possibilities of a well constructed sewage system than are to be found in the city of Rome. Here the Cloacus Maximus, the main sewer of the city which was constructed in almost pre-historic times, still continues to be used as the principal outlet of the sewers of Rome. While it is hardly to be expected that we will build a sewer which will be of such durability, still we owe it to ourselves, to our posterity and to the future growth of the city, to construct a good and sanitary sewage system, and while this will cost us something at first, it will be in the long run our cheapest method of disposing of our waste matter. Casting all sentiment aside, one outbreak of typhoid fever, such as we may have at any time from a cesspool system, might cost us in dollars and cents a sum which

*So. Pas. Rec., Sept., 1913.

would go far toward putting in a system which would almost make epidemic diseases of that kind an impossibility.

I wish to say in strongest possible terms that the time has come when any city should feel itself disgraced by a widespread outbreak of typhoid fever or of most other infectious diseases. We have a beautiful residence city. We are going to continue to live here. Let us unite in doing all that we can to make it healthy and happy for ourselves and for our neighbors.

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*CRIMINALS AND SICKNESS.

It is probably no exaggeration to say that the heaviest tax which we are called upon to pay is the tax levied by criminals and by sickness. At the congress held in Washington in October to consider the care of criminals it was stated on what was supposed to be good authority that the annual cost of crime in the United States is not less than $6,000,000,000. This is nearly one-third more than the value of all the corn, wheat, cotton and hay produced in 1909. It was also stated that the loss of life occasioned by crime each year amounted to not less than eight thousand people.

A conservative estimate of the cost of sickness each year places the estimate at not less than $1,500,000,000 with an average of 3,000,000 sick people continually on our hands. In other words, our criminals and our sickness costs us more than $7,000,000,000 each year. If any such tax upon our prosperity were necessary, we ought, of course, to assume it without complaint, but when we reflect that the greater part of this enormous tax is due to preventable causes we can readily see that it is a burden which we should not carry.

Prof. Adolph Prins of Belgium, one of the most profound criminologists in the world, said in a recent address, "Society has no more criminals than it deserves." In other words, he regards crime as preventable, partly by wise legislation and partly by improving the physical condition of the people.

There is no other profession which should be as much interested in the prevention of crime and sickness as the medical profession, and there is no class of people who should study sociology and hygiene in the broad sense of those terms as thoroughly as should the physician. There is no reason why the Osteopathic physician should not make his influence profoundly felt along these lines, and if we are not lacking in enterprise and rational patriotism we shall do our utmost to aid in forwarding the work of criminal reformers and hygienists.

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*West. Ost. Dec., 1910.

*INFECTION BY MEANS OF WATER AND MEAT.

The Broad Street Well of London is as much a classic to the public hygienist as is the tip of the onion to the student of cell division. In 1854 there was a serious outbreak of cholera in the Parish of St. James in London. The outbreak was so serious in character and the death rate was so high, that it led to a careful investigation being made as to the source of the disease. After a long and critical investigation it was found that almost all cases of cholera in the parish were those who drew their supply of water from this well. In this parish there was a workhouse containing 535 inmates; among these scarce any cases of cholera developed. There was a brewery employing seventy workmen who were practically free from the cholera. In both of these cases, water was drawn from private supplies. As analysis proceeded in these cases, it was found that it was only those who secured water from the Broad Street Well who were severely suffering from the epidemic. When an investigation was made in regard to the water supply of the well, it was found that drainage pipes from a number of houses passed almost over the top of the well and that these pipes were seriously cracked within a few feet of the edge of the well, thus permitting sewerage matter to pass almost directly into the water. The last link in the chain of evidence against this well seemed to be forged when it was found that a visitor in one of the houses from which these drain pipes came, had come to the house suffering from a well-marked case of cholera about two weeks previous to the outbreak of the disease. This is perhaps the first case where contagious disease was positively traced to water supply. Previous to this time many hygienists had suspected the dangers of polluted water and much had been written in regard to the desirability of pure water, from the time of the Mosaic law up to our own day, but the evils had been suspected rather than definitely proven.

Two European cities, Hamburg and Altona, formed practically one municipality, lying on the two sides of the Elbe river. Hamburg derives its water supply directly from the river; Altona filters its water carefully before using it. In 1892 Hamburg suffered severely from cholera, while Altona remained almost entirely free from the disease. As all other conditions in the two cities were practically the same, it seems almost certain that the freedom of Altona from the disease was due to the greater care exercised in protecting the drinking water.

It is from cases of this kind that we learn the possibility of cities

*Jour. A. O. A., Aug., 1918.

protecting their citizens from disease, and no higher duty can devolve upon any city than to intelligently exercise this precaution. We have already advanced to the stage where the individual may insist that he be protected from dangerous holes in the road and from defective bridges. It is only a short step to the time when he will demand that he be protected from communicable disease. It is as manifestly impossible for the traveler to take the necessary precautions to protect himself from disease, as it is to make examinations which will protect him from defective bridges. When little or nothing was known of the method of communicating disease, such protection was impossible; now the protection against many diseases is simply a matter of exercising a sufficient amount of care.

It is evident that all that has been said in regard to cholera may be said with equal or greater force of typhoid fever. All excreta from patients suffering from this disease is known to be rich in typhoid bacilli, and a small amount of matter thrown on the surface of the ground in the mountain camp may pollute the river many miles away and the polluted river, either through its water or its ice, may spread contagion far and wide. Our smaller towns stand in particular danger of water-born disease, because it is so common for them to get their water from wells and to have cess pools which are frequently nearly as deep as the wells. Many cases of children's disease can undoubtedly be traced to sources of this kind.

Diphtheria, scarlet fever, and probably measles are readily disseminated by milk when it is handled by those who are suffering from any of these diseases. It seems to be well established that both tuberculosis and anthrax are also spread by milk.

It now appears that meat may be a menace in at least two different ways. It is very certain that there are a number of pathogenic bacteria belonging to the colon group which may infect meat and which may be transmitted to those who use it as food. Few cases of this kind have been reported in this country, but a number of well authenticated cases have appeared in Europe. It is not easy to see how a consumer is to be perfectly protected from danger of this kind. It is quite likely that animals, as well as people, may act as "carriers." That is, they may transfer bacteria without themselves apparently suffering from the infection.

The other danger in meat is in the post mortem changes which may occur in it. It is easy to provide against these dangers; indeed, the problem is very largely solved by cold storage under proper supervision.

Personally, I believe that the danger from animals infected with tuberculosis is much less than is popularly believed. We have built up an elaborate system of meat inspection and it is so thoroughly entrenched in the good graces of our people that it is rather a thankless task to assail it. While I do not believe that it accomplishes very much good along the line that it was intended to accomplish, it may do so much collateral good in making the slaughter houses clean, doing away with the cruelty and unspeakable filth which once characterized these places, that the inspection may be worth all it costs and even much more. I fully believe that eating tubercular meat is much more of an offense to the esthetic senses than it is an offense to the laws of health. This belief is based upon the fact that it has been impossible to secure any well authenticated cases of persons contracting tuberculosis in this way, and further upon the theoretical consideration that the bacillus of tuberculosis is extremely sensitive to heat and that it is killed by any ordinary process of cooking. It is almost universally true, that let any belief, no matter how intrinsically absurd, once get deeply rooted in the public mind, there always seems to be plenty of evidence to confirm and perpetuate it. This is especially true when great financial interests are at stake.

It is a little amusing to the student of human nature to notice how some people seem to believe that all wisdom belongs to the past, and to notice how others fail to give the past credit which is its due. Many of us who are students of modern science really appear to believe that all knowledge belongs to our own day. If a book bears the date of ten years ago we regard it as too modern for the museum, but entirely too old for the library. Much of this feeling is without just foundation. It is now more than two hundred years since careful physicians have known that some diseases are due to animal infection. When this discovery was made the educated physicians of the period quickly jumped to the conclusion that all diseases were due to animal infection. As the methods of research then employed did not reveal the parasites causing disease, a long period of doubt ensued, and the origin of disease being due to infection was not discussed again until almost our own day.

*FOOD PRESERVATIVES.

Few subjects are more widely discussed at the present time than the purity of food and the best means for its proper preservation. The subject is of far-reaching importance, and is by no means easy of solution. The natural difficulties surrounding a condition so complex are greatly increased by commercial interests, which are deeply involved, and also by well-meaning men and women who possess little real information, but who are anxious to make themselves heard.

In the newspapers, and even in some periodicals, which should be taken a little more seriously than we take the daily press, the terms "natural preservatives" and "chemical preservatives" are frequently used.

Before entering upon any discussion of the preservation of food, I wish to say a few words in regard to the causes leading to its decomposition. These causes now appear to be two-fold. One of these is the omnipresent micro-organism, spores of the various molds, bacteria and protozoan animals. These are everywhere present in the air, and unless complicated precautions are taken they readily fall upon and into all kinds of food material, and if the food material offers them an opportunity for growth, they straightway proceed to develop and increase in numbers, and by using the substance upon which they are growing for their own food, they quickly bring about its decomposition. These are the most active and most clearly recognized agents of food destruction, and until comparatively recently they have been the only clearly recognized causes of decomposition, but recent investigation has shown that many cells produce within themselves ferments or enzymes, which will eventually change the chemical structure of the cell, sometimes fitting it better for human consumption and sometimes rendering it utterly unfit for food. The changes brought about by these substances which are within the cell are known as autolytic changes. The ripening of fruit after it is picked, the increasing juiciness of the lemon, the better flavor of meat, the increasing sweetness of the grape, fig and orange, are all examples of autolytic changes. The final decomposition of meat, the decay of fruit and the souring of milk are all examples of changes brought about by bacteria. Since the changes (autolysis) are due to substances inherent in the living cell, it is manifestly impossible to protect substances subject to these changes from autolytic action, but whenever it is desirable to do so,

*West. Ost., Aug., 1910.

autolysis may be delayed by keeping the food in cold storage; under such conditions, autolysis proceeds very slowly. Many fruits are protected from bacterial invasion by the character of their rinds. Examples of this are found in the various citrus fruits, apples, pears, cherries, etc. Unless the skins or rinds of these fruits are abraded in some way, they are in little danger of bacterial invasion until autolysis is complete. In many cases the autolytic changes have seriously affected the integrity of the covering, and bacteria and molds are then able to penetrate.

From what has been said, it will readily be seen that cold storage, together with the preservation of the integrity of the skin and wrapping in such a way as to exclude bacteria, etc., are the best methods for the preservation of fruit. Cold storage will also check the autolytic changes which take place in meat and will greatly retard the growth of bacteria producing putrefaction. There are of course many chemical compounds which may be used to check bacterial growth in meat and other foods. Among the many preservatives thus used, formalin has occupied an important place. The place of formalin has been important not only because it is singularly efficient as a preservative, but because its effect upon the human system are unquestionably deleterious. This has been so definitely established that its absolute prohibition is fully justified. Another efficient preservative is sodium benzoate. This acts as a preservative when present in very minute quantities. Sodium benzoate is a white, odorless, sweetish, astringent powder; it is highly soluble in water, and the most careful experiments have failed to demonstrate that it has any appreciable effect upon the human body, especially when used in the minute quantities, as is done in the preservation of food.

It has long been known that spices like cloves, nutmeg, cinnamon and allspice are preservatives of organic substances. Spices have been used more or less in embalming human bodies, and the housewife makes free use of some of them in foods which she desires to keep. The preserving effects of these spices appear to be due to an essential oil which they contain, and which is readily extracted by the foodstuffs. Used in great moderation, it is probable that little real harm can be attributed to them, although it is a little absurd for people who use strong spices to object to sodium benzoate. Their tolerance of the one is born of long acquaintance, and their intolerance of the other is due to the fact that it has a chemical name.

The time is probably not far distant when many of our foods will be manufactured. We are rapidly learning how to build up complex nitrogenous compounds, and it is quite possible that manufactured proteids may some time take the place of the proteids which we now derive from vegetable and animal sources. When that time comes, the question of food preservation will perhaps be less important than it is at the present.

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*PRESERVATION OF FOOD SUPPLIES.

It is a fact of world-wide recognition that the cost of living has seriously increased during the last twenty-five years, and there is some reason to fear that the cost may increase still more. This presents a very serious problem to the vast majority of the people, and the welfare of society demands that a thorough investigation be made and that we shall bring the cost of living down to a figure which is commensurate with the incomes of the majority of the people. It is probable that this increased cost of living is not due to any one factor. The large areas of highly fertile land devoted to the production of tobacco and of grain used for the production of intoxicating liquors is unquestionably one cause of the high cost of living. If this land and the labor now devoted to it were put into the production of foodstuffs, it requires no argument to show that the cost of living would be materially lessened.

One factor which is tending to lower the cost of living is our increased ability to preserve perishable foodstuffs. By means of our refrigerator cars it is possible to transport tropical fruits to the colder regions of the North, and this not only adds to the comfort of the people, but materially to the lessening cost of living. At the present time it is estimated that more than three thousand million of dollars of food is continually in cold storage. At least one-half of this great value is represented by meat. Milk is an extremely perishable food, but the butter and cheese derived from milk may be preserved for a long time. The value of milk as a food can also be preserved by evaporation; the same is true of eggs, but in order that either milk or eggs shall be valuable in a preserved state they must be in good condition when they pass into the hands of the preserving company. Contrary to popular belief, bacteria very readily penetrates the shell of the egg. Many of these bacteria are practically harmless, but if they are allowed

*West. Ost., Oct., 1912.

to accumulate in large numbers, they will almost inevitably destroy the value of the egg as a food product. It is a well known fact that if an egg be held near a burning lamp and examined through a tube, dark spots can be seen in eggs which are beginning to spoil; these dark spots are in reality masses of bacteria, and if there are many of these masses of bacteria the dry product of the egg is materially lessened in value for food. Denmark at the present time is experimenting freely in exporting frozen milk. This frozen milk finds its way into the markets of continental Europe and England, and is regarded as a most valuable food.

There are five principal methods now employed for preserving food. The first method is by the use of harmless preservatives: the use of sugar and vinegar, various spices and oils, are examples of this method. The second method is by the use of chemical preservatives; of these sodium benzoate, formalin and salicylic acid, and boric acid, are the most important. It is still an open question as to the effect of these preservatives upon the human body. In a general way it certainly seems best to avoid the foods preserved by this method until we shall be sure that no evil effect follow their use. The third method of preserving food is by heat; this is employed in all processes of canning fruit, and is based upon the principle of heating the fruit until the bacteria are destroyed, and then sealing it up in such a way that none may enter; in this way fruit may be almost indefinitely preserved. Closely related to this method is pasteurization, which consists in heating milk, or any other food material, to a temperature of about one hundred forty degrees and maintaining this heat for a period of twenty minutes or more, and then rapidly cooling the material. By this process large numbers of bacteria are destroyed, and the food in consequence will remain for a considerable length of time unchanged. The fourth method of preserving foods has already been alluded to, and that is by desiccation, or drying. Meat, eggs, milk and fruit are all more or less successfully preserved in this way. The fifth and last method of preserving food is by low temperature. When the temperature of food is reduced nearly to the freezing point bacterial activity practically ceases, and in this way food may be almost indefinitely preserved.

When we remember that one bacterium may, under favorable conditions, give rise to more than ten million descendants in twenty-four hours, and that practically all decay is due to bacterial action, we can understand the supreme importance of limiting their increase.

On the other hand it is comforting to remember that most kinds of bacteria produce decay very slowly, and no matter how numerous they may be they produce little or no effect if taken into the human body. This brings us to a special consideration of the cold storage problem. The present cold storage system has evolved from the New England cellar; and as the cellar in the old days was the store-house wherein food abundant in the fall might be cared for and slowly used during the winter, so the cold storage plant has become a most important place for the conservation of food in seasons of plenty, and a place from which it may be drawn as the outdoor supply diminishes. Cold storage has now become a matter of so much importance that the Canadian government subsidizes cold storage plants in the large cities, and thus makes it possible for people to procure cold storage foods at a much lower price than they otherwise could.

It is evident that different kinds of food must be preserved at different temperatures. Fruits, vegetables and eggs in the shell, would be seriously injured should the temperature fall below the freezing point; on the other hand mixed eggs—eggs which have been taken out of the shell and the white and yolk mixed—may be frozen without injury. Whether one is dealing with the whole egg or with mixed eggs, it is important that the eggs should be good. April and May eggs taken from the cold storage plant six months after they are laid are really better than the summer eggs which are taken from the poultry yard to the store and sold four or five days after they are laid.

There are two methods employed in the cold storage of poultry; one is known as the dry method, and the other is the wet method. When the wet method is employed, the birds are immediately packed in ice, and sent in that way to the cold storage plant. The objection to this method is that the skin is more or less broken by the ice, and in that way the entrance of bacteria is made easier if they are kept for any length of time without being frozen. In the dry method the dead birds are simply kept cold until they are placed in cold storage. Sanitarians are discussing most earnestly the advantages and disadvantages of dressing poultry before placing it in cold storage. At one time the argument seemed to be most strongly in favor of dressing the birds before freezing them, but further investigation has shown that the best results are obtained by freezing the birds before dressing, and then slowly thawing them and dressing them just before they are cooked. There seems to be little good reason for the feeling of prejudice existing against cold storage chickens, or indeed meat of any kind. It is highly probable that the chicken that has been in cold storage for a year has undergone less deleterious change than has the bird in the grocery which was killed two days before it was sold.

Beef, pork and mutton are now well kept in cold storage plants. The usual process which is followed is to place the meat at once in the "chill room" for one day; the temperature of this room varies between 32° F. and 40° F.; the meat is next moved to the "freezer", where the temperature is from 9° to 12° below zero, F.; in this room the meat is kept for three or four days, until it is thoroughly frozen; it is then removed to the "cold storage room", which has a temperature of from 12° to 15° F., and there it may be kept indefinitely. Changes take place very slowly while meat is in cold storage. There is probably a continuous, though very slow chemical change, which brings about the peculiar condition of meat known as ripeness; this is beneficial rather than injurious to the meat. In order that the cold storage plants may render the best service, two things are necessary; first: Cold storage warehouses should be subjected to government inspection, as to construction, ventilation and temperature, and sanitary conditions. This inspection should also be extended to refrigerator cars. Second: All food designed for cold storage, should be carefully inspected before being committed to the warehouses. Could these conditions be met we should have little reason to complain of cold storage products.

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*PROOF OF CONTAMINATION OF FOOD.

It is often a matter of great importance to be able to determine whether or not a community stands in danger of infection from typhoid fever and from other dangerous intestinal diseases. Until recently, about the only way this question could be answered was by waiting and seeing. There is however, a practical test which may be applied to the solution of this problem, and that is by observing the presence or absence of certain protozoa in fecal matter. Entameba coli, Lamblia duodenalis and the Trichomonas intestinalis are all intestinal parasites, and so far as I know, they do not live for any length of time outside of the alimentary canal; hence their presence in fecal matter is an indication that the person from whom this matter came had ingested fecal matter from some other person infected by these parasites. It

*West. Ost., April, 1918.

is not difficult for a biologist to recognize these forms with almost absolute accuracy. There are at least two ways by means of which these parasites may be spread from one person to another. The first way is by the fly, which not only breeds in fecal matter, but readily resorts to it for food. The second way is by the fecal matter becoming dry, and these parasites being carried about on dust while they are in the spore stage of their development. To make this matter a little more clear, I am going to call attention to five facts connected with these organisms:

1. They are strict parasites, not known to reproduce outside of the alimentary canal.

2. Any person infected must acquire his infection from some person already infected.

3. These parasites are readily discharged from the body with the feces.

4. The spores are sufficiently small to be readily carried by flies.

5. Flies breed in, and readily visit, fecal matter.

It really seems that the chain of evidence is quite complete. Reports show that in many towns from 10% to 60% of the people show the presence of these parasites. These parasites themselves are not likely to produce serious results. Two of them, at any rate, usually produce no appreciable result of any kind, but the conditions which are favorable for carrying these parasites from one person to another are equally favorable for spreading typhoid fever and the various intestinal diseases from which children especially are so likely to suffer. The presence of these parasites is always an indication of poor sanitary arrangements, and wherever they are widely found, attention should be immediately given to improving sanitary conditions. While there is always a possibility that these organisms may be shipped from one place to another on articles of food, the fact still remains that this is certainly not the common way for them to be dispersed. Wherever these parasites are found, the meaning should be quickly understood by the health authorities and the action which should follow may be expressed in two words: Clean Up.

*WATER AS A CARRIER OF DISEASE.

Among the various dangers to which humanity is subjected, none is more subtle than the "cup of cold water." Next to the air which we breathe nothing is more necessary for the immediate continuance of life than water and unfortunately air and water are the most frequent bearers of pathogenic organisms.

From the very nature of the case, we might rightly infer that diseases having their seat in some part of the alimentary canal would be the ones which would be the most frequently transmitted by means of water. It is true that septic bacteria from wounds and expectorated matter from the lungs and air passages laden with pathogenic bacteria may find their way into water and be ingested, but in most cases these bacteria are inert in the alimentary canal, while the bacteria which have caused the various diseases affecting the alimentary canal would not unnaturally be returned to water, and if this infected water is in any way mixed with drinking water it is easy to see how disastrous results may follow.

In a critical discussion of sanitation it is necessary to distinguish between polluted waters and infected waters. By polluted water is meant that which holds decomposed or decomposing organic matter, either in suspension or solution, but may be free from pathogenic bacteria. By infected water is meant that which contains pathogenic bacteria. In almost every case infected water is polluted, but it does not necessarily follow that polluted water is infected. In a vast majority of cases both infection of water and the pollution result from contamination by sewage.

Many people regard rain as it falls from the clouds, and water derived from melting newly fallen snow, as almost absolutely pure. Careful investigation shows that this is not the case. Both organic and inorganic matter is found in such water, and both kinds of matter are washed out of the lower strata of the air. Damp snow acts as a filter and water from this source not infrequently is heavily laden with dust and is very rich in many kinds of bacteria, pathogenic forms being among the number. I have in more than one case found rotifer worms and various forms of infusoria in water obtained from melting newly fallen snow.

Of all diseases not one has been more certainly traced to infected

*Ost. World, Aug., 1905.

water than typhoid fever. The history of this disease is long and interesting, and its various chapters are highly illustrative of the methods followed by true scientific workers. On three continents, North America, Europe, and Australia specific epidemics of this disease have been investigated, with the result of tracing the infection to the supply of drinking water. It is only proper to say that water is not the only source of infection, for more than one most serious epidemic has been traced to raw oysters.

Aside from typhoid fever the diseases which have been most clearly traced to infected water are Asiatic cholera, dysentery and various forms of diarrhoea. It is probable there are several other diseases which are frequently acquired from impure water. Among these may be named tuberculosis, and actinomycosis.

It has already been stated, that water obtained from newly fallen snow may be dangerously infected. Water obtained from ice may also be dangerous. Careful experiments have shown that pathogenic as well as nonpathogenic bacteria may remain frozen in ice for an indefinite period of time without suffering any loss of vitality. This being the case it is easy to see why the source of ice should receive the most careful attention. Not only is this true of ice cut from streams and lakes, large and small, but it is true of manufactured ice, as this is free from dangerous bacteria only when it is made from pure water. So far as I know there is no rough and ready means of determining at all times the fitness of water for household use. Many physicians rely on what they call the "Potassium permanganate test." This is made by observing whether or not the water reduces the permanganate, the reduction being determined by the change in color in the solution of the permanganate. Certainly no water which decolorizes the permanganate is fit for culinary or drinking purposes, but it by no means follows that all water which does not decolorize it is potable. The fitness of water for domestic use can only be determined by a competent chemical, microscopical and bacteriological examination.

It is by no means easy to render contaminated water fit for use. For immediate results nothing is probably more effectual than to boil the water, but this is at best only a make shift and its good effects are only temporary. If the air contains any considerable number of bacteria, especially the bacillus of typhoid fever the water may contain more twenty-four hours after it has been boiled than it contained before boiling.

Any real remedy for defective water must extend back to the source from which the water is derived. The most careful experiments and observations have shown that water is to a greater or less extent self purifying. The earlier thought was that this purification was brought about by a process of oxidation and that falls and rapids in a stream were favorable to rapid purification. We know now that water is most rapidly freed from its living burden in the quiet, slowly flowing places. That in these places the organic matter upon which the organisms live, settles slowly to the bottom and the organisms themselves die partly from the want of proper food and partly from the effects of the sunlight, which is singularly fatal to almost every form of bacterial life.

Careful study has shown that there is much less danger if the sewage of a city is turned into a slowly flowing river, and one hundred miles below water for domestic uses is taken from the same stream, than if the same sewage had been turned into a rapidly flowing river in which there are numerous water falls, and the water withdrawn as in the former case. It is probably a mistake for the smaller cities and towns to have covered reservoirs. It is true that the cover keeps out considerable dust and foreign matter of various kinds, but it also protects the water from the light of the sun. There is no germicide known which is equal to the strong, clear light of the sun.

It seems needless to remind physicians that of all people they should most thoroughly understand public hygiene. Their most immediate duty may be to those who are sick, but it is no less their duty intelligently to point out those errors in public sanitation which most inevitably lead to wide spread epidemics.

We have in our imagination seen the look of consternation which crossed the faces of Jewish bigots when they were told that "the Sabbath was made for man and not man for the Sabbath." The same look comes across the faces of many modern physicians when they are told that their profession exists for the purpose of aiding in the alleviation of disease and that disease does not exist for the sake of helping men and women of a certain profession to make a living.

*GOOD WATER.

The value of living is measured by efficiency, and efficiency is very largely dependent upon physical health. To a certain extent the preservation of health is a duty which falls upon each individual but there are some factors upon which health is dependent that the individual cannot properly supervise, and these factors must either be neglected or they must receive the attention of those invested with public authority. Few things are more essential to public health than a pure and plentiful supply of water. At least two things are necessary to an ideal water system:

First, the water must be in a pure and uncontaminated condition as it comes from its source, and

Second, it must be stored in clean and properly constructed tanks or reservoirs.

The outlet of the reservoir should always be a foot or more above the bottom so that whatever dust and dirt gets into the reservoir may settle below the outlet. It is true that the reservoir will keep clean much longer if the water is drawn from the bottom, but of course it keeps clean at the expense of the water it supplies, as under this condition all of the dirt passes out into the pipes supplying houses. Reservoirs should be carefully covered and screened so that not only small animals are excluded but also insects of all kinds, as otherwise the water becomes contaminated with their larvae. Southern California is becoming so thickly populated with tubercular people that organic matter of all kinds should be regarded with suspicion, and public reservoirs into which dust and debris fall are a menace to public health. It is a matter of vital importance to the citizens of South Pasadena to see that their water supply is made and kept as good as it possibly can be. The expense connected with maintaining a proper water supply is very small compared with the expense which would be entailed by an epidemic of typhoid fever, or by occasional cases of tuberculosis. Proper regulations along this line can only be obtained by the intelligent co-operation of all public spirited citizens, but by such co-operation all that is necessary can be secured.

*So. Pasadenan, Oct., 1907.

*COLD WATER.

Until recently there has been an absolutely senseless fear of cold water. Fortunately for suffering humanity, the attitude of the public is now undergoing a marked change. Almost all primitive theological systems teach that whatever we like is necessarily bad, and this idea seems to have been thoroughly grounded in the race. Recently, however, saner views are being accepted and we no longer deprive patients burning with fever of the blessings of cold water. We have learned that ice water is as beneficial as it is agreeable, and we have also learned that ice cream promotes digestion rather than retards it. While the first effect may be to contract the blood vessels of the stomach and so produce an anemic condition, we know that this is immediately followed by a reaction which brings on a hyperemia highly favorable for digestion. We have all been seriously warned against the evil of drinking water with our meals, but the most recent investigation has shown that a moderate amount of fluid taken during the mealtime is beneficial rather than injurious. Within reasonable limits, the amount of gastric juice secreted by the stomach keeps in close relationship with the amount of fluid which one swallows; and thus the digestive power of the stomach is increased by drinking rather than decreased. The power of absorption is certainly greatly increased by drinking. The fear of the cold bath when one is warm is entirely without foundation. If one is overheated, either from fever or from over-exertion, there is nothing better than cold water to reduce the temperature. There may be individual cases where care would have to be used in the application of cold water, either internally or externally, but the statements herein made are certainly true for the great majority of people. A cold draught of air, providing it strikes the greater part of the body, is injurious in proportion to the amount of dust which it carries; without the dust, little harm is likely to come from it. In general, we are safe in reversing the old rule; and instead of feeling that whatever we enjoy is necessarily bad, we should feel that whatever we enjoy is good, and that it is good because we enjoy it.

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*West. Ost., Sept., 1913.

*MILK.

There is a marked tendency to give increased attention to the sanitary condition of milk and milk products. This is especially marked in the United States. In a few European countries, Switzerland, Belgium and Holland, and to some extent in England, milk and milk products have long received careful attention, and in consequence of this milk-borne diseases are rare in these countries.

Milk is an almost universal food, and while there is some question as to its supreme value for healthy people engaged in ordinary work, there is no doubt of its great value for the sick and convalescent and it, of course, forms the only natural food of infants.

The rate of mortality among grown people and among children after the first year or two of life has been greatly diminished, but the mortality among infants under one year of age is still enormously great and a large proportion of those who lose their lives thus early die as a result of gastro-intestinal diseases, and these diseases are almost invariably due either to infection from food or to chemical poisons formed in food by bacterial action.

There was a serious outbreak of typhoid fever in Washington, D. C., in 1906. Public opinion in that city demanded a careful investigation as to the cause of this outbreak, and the investigation which followed was conducted from a broad standpoint and much light was thrown upon milk-borne diseases. The investigation not only showed that milk might act as a carrier of infection, but it showed how the infection might be communicated to the milk and how, as the result of infection, even by non-pathogenic bacteria, deleterious compounds might be formed in the milk.

Milk in the udder of the cow is almost or quite free from bacteria, but the lower portion of the milk duct harbors large numbers of bacteria; so before the milk is really drawn to the surface it becomes infected. The air in and around cow stables contains large numbers of bacteria which readily drop into the milk, and every particle of dust and filth from the cow is well loaded with bacteria, so as a general thing large numbers of these organisms are introduced into the milk before the milk leaves the stable.

Milk is a very excellent culture medium for bacteria and hence the number of bacteria is very rapidly increased.

Recent investigations made of milk in St. Petersburg, Russia,

*West. Ost., Oct., 1910.

show that the average milk there contains from 10,200,000 to 82,300,000 bacteria to the cubic centimeter. When one remembers that twenty-five drops of milk will make about one cubic centimeter, some idea can be formed as to their immense numbers. Investigations of milk made in Liverpool show that ordinary milk there contains about 17,000,000 to the cubic centimeter. The average in London is 31,880,000. The greatest amount found in milk publicly offered for sale in Washington, D. C., was 307,800,000, with an average of a little more than 22,000,000. If milk were at all transparent, such numbers of organisms would make it so murky that it would be nearly or quite impossible to see through it.

It is almost needless to say that any food product containing such numbers of living organisms is utterly unfit for use and that to infants especially it may be the source of the greatest danger. There seem to be three cardinal requirements for good milk aside from perfectly healthy cows. These are cleanliness, immediate cooling and rapid delivery to the consumer. To get the best results in regard to milk there must be intelligent and free co-operation of the dairymen, the health officers and the consumers.

During the study which was made of conditions at Washington, D. C., it was found that 11% of the dairies furnished milk which was tubercular to such an extent that guinea pigs quickly died when inoculated with it, and at least one of the children's homes in Washington got its regular supply of milk from one of these dairies. I have noted the experience of the Washington investigation only because more careful study has been made of conditions there than in most other cities. Equally careful investigations of other cities might show conditions no better.

Comparatively few animal parasites are transmitted by milk. In the Washington investigation no case of animal parasites was discovered. In the city of Pasadena we probably had a few cases of amoebic dysentery indirectly transmitted through milk.

The chemical analysis of milk in Washington showed that about 12% of the milk sold in the city was below the standard established for butter fat. Milk can easily be pasteurized in the home if any one has reason to feel that it may contain either pathogenic bacteria or excessive numbers of non-pathogenic bacteria. The pasteurization of milk is most easily accomplished by placing the milk in a comparatively flat jar or pail and placing this in water raised to a temperature of 170 degrees. The temperature of the milk should rise to at least 160 degrees and it should be kept at this temperature for at least a period of twenty minutes and then be rapidly cooled by placing it in ice water. Milk treated in this way is changed very little so far as taste is concerned, and while not all of the bacteria in it are killed, they are greatly reduced in numbers and at the low temperature at which the milk should be cooled they increase very slowly, and thus the length of time that the milk keeps sweet is greatly lengthened.

It cannot be stated too strongly that the value of pasteurizing is wholly dependent upon the prolonged heating of the milk and its rapid cooling and maintaining it at a low temperature.

If these conditions are not observed, pasteurizing may increase rather than decrease the bacterial content of milk.

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*MILK.

There are very few articles of food whose purity and cleanliness are more important to us than milk. Under our State law it is declared "Milk is the fresh, clean, lacteal secretion obtained by the complete milking of one or more healthy cows, properly fed and kept, excluding that obtained within fifteen (15) days before, and five (5) days after calving, and contains not less than three (3) per cent of milk fat, and not less than eight and five-tenths (8.5) per cent of solids not fat." With the exception of eggs no single article of food contains the varied amount of nourishment which is contained in milk. This fact renders milk especially liable to act as the carrier of injurious ferments and of bacterial forms of life. In a general way it is safe for us to understand that any article which is useful to us for food is a substance upon which bacteria will readily grow, and thus it may become the medium for the introduction of bacteria into our own bodies. There are four sources of milk pollution. The first of these is at the place of milking, and in the room in which the milk is immediately handled after being drawn from the cow. A second opportunity for pollution is during its transit to the store or depot from which it is distributed to the stores and milkmen. The third is at the store or in the hands of the milk man where the milk is kept previous to its delivery to the consumer and the fourth and frequently the most dangerous place for pollution is in the home of the consumer. If milk is to be clean, as it should be, every precaution must be taken from the place of its source until it has reached the stomach of the consumer. Cows must not only be healthy,

*So. Pasadenan, Mar., 1908.

but they must be clean. They should not be permitted to either stand in, or drink impure water. The stable should be light and well ventilated and kept scrupulously clean. The milker should wear a special dress which is frequently washed. His hands should be clean and dry when he begins the milking. All waste matter from the stable should be deposited at a considerable distance from where the cows are actually kept. The milk should be cooled as soon as possible after it is taken from the cows, and it should be put in cans or receptacles which are scrupulously clean and which have been subjected to the action of boiling water so thoroughly as to destroy all forms of bacterial life which might otherwise be present. It is highly desirable that milk should pass as rapidly as possible from the producer to the consumer. Unless special pains are taken to keep the milk at a low temperature the bacteria in milk are subject to an enormous increase in numbers. Milk which contains only a few hundred to the drop when it leaves the producer may have the number increased to hundreds of thousands in twenty-four hours' time if it is kept in a warm place. These bacteria are for the most part harmless, but still they continually reduce the food value of the milk by using the sugar and proteids for their own growth and development. The bacteria which have been found in milk may be divided into four groups; the first group being the common bacteria of air, water, and soil. The second group are those forms of bacteria commonly found in sewage and in the intestines of people and animals. The third group are the bacteria which produce fermentation, and the fourth and dangerous group are the pathogenic bacteria or the bacteria which produce disease. It is not difficult for us to see where the first group of bacteria come from. Small particles of dirt on the body of the cow will account for the bacteria of the soil. The water used in washing the milk pails will produce large numbers of water bacteria, and the air of the average cow stable is heavily charged with bacteria which is continually settling into the milk pail. It is probably no exaggeration to say that in the ordinary cow stable from five to ten thousand bacteria will fall upon each foot of space every minute of time. Bacteria of intestinal origin may readily come from the filth so frequently found upon the cow. Bacteria of fermentation are very abundant in the lower part of the milk ducts of the cow, and the first milk obtained from the cow introduces these in large numbers into the pail which may afterward be filled with milk. The more important bacteria of fermentation are those whose action produces lactic acid in milk. This is the most common acid of sour milk. Another acid frequently formed in milk is butyric acid. Alcoholic fermentation occasionally occurs in milk from some forms of bacteria which may be present. Other forms are capable of coagulating the albuminous part of the milk without the milk becoming sour. Still other bacteria produce the so-called "disease" of milk and as a result of these diseases milk may be either bitter, slimy, or soapy. Occasionally bacteria get into milk which cause the milk to change its color, without seriously affecting the character of the milk. Some of these bacteria produce a red milk, others may cause the milk to be yellow or blue. The subject of pathogenic bacteria in milk, or those bacteria which produce disease among people, is so important that I defer the discussion of these to some future time.

*CERTIFIED MILK.

Certified milk is a comparatively new term in the commercial world. The term was first used in describing the milk sold in some eastern cities. The standard of certified milk is the highest which it is practically possible to attain. In order that milk may properly be classed as "certified," the cows from which it is obtained must be subjected to frequent inspection, and no cow which has the slightest trace of tuberculosis must be permitted in the herd. Every cow must be carefully washed before she is milked. The milker must not only have his hands sterilized, but must be clothed in a newly washed and sterilized gown. The milk must be drawn into a sterilized vessel and every particle of dust and filth carefully excluded. As soon as possible after milking, the milk is placed in sterilized bottles and carefully closed. The bottles are sealed in such a way as to prevent the admission of bacteria of any kind and delivered to the consumer in these bottles. It is needless to say that milk which receives all the attention above mentioned cannot be sold in competition with even ordinarily good dairy milk. It is questionable whether adults would be specially benefited by using milk of this character, but it is highly probable that infant mortality would be decreased if only certified milk was used in feeding them. The time is not far distant when there will be an opportunity to purchase certified milk in all our towns and cities. Everything along the line of better food must be of deep interest to all who are striving to better conditions for the preservation of public health.

*So. Pas. Rec., Oct., 1908.

*PRESERVATION OF MILK.

In a former article I made the statement that the more nearly fresh is milk when used, the less likely it is to prove dangerous. It occasionally happens, however, that it is absolutely necessary to preserve milk for some time before using it. When one is confronted by such a condition there are two things which may be done: One is to sterilize the milk and the other is to Pasteurize it. I do not mention in this connection the name of any of the many preservatives which are sometimes used in milk, as there is not one which is not highly injurious. Sterilization of milk may be secured by keeping the milk for from thirty to sixty minutes at the temperature of boiling water. Milk subjected to this treatment and then securely protected from the air will keep almost indefinitely. The objection to this treatment is that at the high temperature named the character of the milk undergoes a great change. The taste is seriously impaired and it is much less digestible. By Pasteurization is meant a process whereby most of the bacteria in the milk are destroyed by keeping the milk for some time at a temperature destructive to the bacteria but not sufficiently high to change the character of the milk. The most desirable temperature for this purpose is between 167 degrees and 185 degrees Fahrenheit, or between 75 degrees and 85 degrees Centigrade. At this temperature almost all forms of bacteria are destroyed. The best way to effect the Pasteurization of milk is to set a tin can or pail containing the milk in water heated to the temperature suggested and keep it there from fifteen to twenty minutes after the milk has been raised to the temperature of the water. The milk should then be carefully covered and cooled as quickly as possible. If it can be passed at once from the hot water to the ice chest it is well. Pasteurized milk kept in clean dishes and at a low temperature will undergo very little change for days. Infant mortality would be greatly reduced if during the summer months babes were fed either upon absolutely fresh milk or upon milk which has undergone careful Pasteurization.

*So. Pasadenan, April, 1908.

*DISEASES WHICH MAY BE ACQUIRED FROM MILK.

The spread of a considerable number of diseases can be traced directly to milk; among those thus spread it is probable that tuberculosis occupies the largest place in the public mind. It is somewhat uncertain at the present time as to whether human or bovine tuberculosis is the same disease and whether the form which appears in cows can be transmitted to human beings. But until this question is definitely settled, it is by far the safer plan to assume that they are one and the same disease and that the disease may be readily transmitted from the infected cow to persons who use the milk from the cow. It is quite certain that when a cow is seriously affected by tuberculosis, the bacilli may be found not only in the fresh milk but also in the skimmed milk, in the butter, and even in the buttermilk, and it is more than possible that whoever uses these articles from the infected cow may acquire the disease. It is certain that bovine tuberculosis is widely disseminated among cattle. In 1901 a careful census of cows was taken in England. At that time there were 4,102,000 cows reported as yielding milk, and of this number at least 80,000 were found to have well marked indications of being tubercular. It is quite probable that the disease is as widely spread in this country. There is reason to believe that it becomes especially dangerous when the udder of the cow is affected. This is sometimes indicated by the swelling of the lymphatic glands immediately in front of the udder. There are technical tests which may be applied to the cow which almost positively proves or disproves the presence of this disease. Even if the cow from whom the milk is drawn is perfectly healthy, the milk may be contaminated by the milker if he, or any members of his family with whom he comes in contact, are tubercular. All of this should impress upon us the vital importance of the most rigid milk inspection. Typhoid fever is another disease which may be widely spread by milk. Not only should no person who has typhoid fever be allowed to come near the milk, but it should not be handled in any house in which there is a typhoid fever patient. Nor should bottles or other receptacles of milk be permitted to be removed from the house of the patient suffering from either typhoid fever or any other contagious disease. While it is not certain that diphtheria is spread by water, it is very certain that it may be spread by means of milk. Cows them-

*So. Pasadenan, April, 1908.

selves may have the disease in a mild form and without being seriously sick may become the means of widely spreading the disease. Milkers, or those with whom milkers come in contact, may become the means of infecting the milk. All that is said of diphtheria may be said with equal force of scarlet fever. Aside from these most dangerous diseases, thrush, sore throat, and diarrhoeas may frequently be traced to the milk supply. All of these may come from cows which give no indication of disease, and frequently where cows are perfectly healthy the source of infection is found to be in the milker, or in some member of his family. All of this emphasizes the supreme importance of cleanliness in handling milk and all milk products. Many infectious diseases would be avoided if only fresh milk were used. Another source of infection of milk is found in the dirty and easily controlled house-fly. The time is not far distant when in enlightened and cleanly communities this insect will be effectually banished. It is not unusual for people to read notes of warning of this kind and smile over the affair and wonder why it is that we are endangered so much more than were our grandfathers, who knew nothing of bacteria. The reply to an objection of this kind is that if we wish to live as they lived we must die as they died, and it is proper to remember that modern hygiene, public and private, has probably doubled the average length of human life within the last twenty-five years, largely by reducing infant mortality. No page of human history is sadder than the statistics of the death rate of infants in our large cities in the near past from causes easily controlled by proper attention to public and private hygiene.

More and more we are coming to learn the great truth that proper care of the body demands the proper mental attitude on the part of the patient, and the proper mental attitude can only be maintained by those who are engaged in useful work. The old Jewish myth that work was imposed upon man as a punishment is not good. It is only by work that man can express himself, and thus come to his highest development. The basis of good health lies in the common sense life of active, energetic usefulness.

*ICE CREAM.

Years ago ice cream was regarded as a luxury to be served out to people in small quantities on the Fourth of July, and occasionally at some church social, but of late it has assumed a position of considerable importance in every-day life, and is widely prescribed by doctors for invalids and children.

Its real value as a food product is a matter of some doubt. It is very certain that while it has considerable food value, its use in large quantities is not conducive to the activity of the stomach. If it is swallowed before it has become thoroughly melted and warmed it must exert something of a depressing influence upon stomach conditions, and may not only be slow of digestion, but may seriously delay the digestion of other articles of food. If it is to be used at all it is certainly of the utmost importance to have its constituents good, and our pure food law requires that the constituents shall not only be good, but that any article labeled ice cream shall conform to certain standards.

Both gelatin and starch are extensively used in thickening ice cream. Various coal tar dyes have been used for desirable colors.

In the District of Columbia a local ordinance requires that it shall contain not less than 20 per cent butter fat. A short time ago a careful bacteriological analysis was made of the product as sold in the city of Washington. As a result of this investigation, it was found that no cream on the market contained less than one million bacteria per cubic centimeter, and that from this the number ranged up to one hundred million bacteria per cubic centimeter. The average was about three and one-half millions per cubic centimeter. The danger of any food from a bacteriological standpoint depends much more upon the character of the bacteria than upon their number. From the figures given it will be seen that a freezing temperature is by no means incompatible with bacterial life. Many of the bacteria found in ice cream are undoubtedly to be found in the products entering into its composition, but it is quite likely that the ordinary ice cream freezer contains such numbers of them that the number found in the product will be materially increased by contact with the freezer.

In several of the cities of Great Britain such serious sickness has been traced to ice cream that cities have enacted special ordinances

*West. Ost., Jan., 1911.

governing its manufacture and sale. The regulations of London, Glasgow, and Liverpool are substantially the same. These provide that:

(1.) Ice cream must be made and stored in thoroughly sanitary places.

(2.) It must not be made or stored in living rooms, no matter how clean nor how well ventilated.

(3.) Strict precautions must be taken to prevent all contamination.

(4.) All cases of infectious disease among those who use the ice cream must be immediately reported.

(5.) The name and address of the maker of the ice cream must appear upon every package.

Many careful health authorities seriously question the value of pasteurizing the milk or cream used in making ice cream, but it is believed by some that when the raw material has been properly pasteurized there is somewhat less danger of tyrotoxicon forming in the ice cream. No matter how favorably we may feel toward ice cream when properly made and properly kept until it is sold, we cannot help feeling that ice cream as it is sold at the corner grocery and on the street is a rather dangerous kind of food, and it is highly probable that a reasonable regulation of the process of manufacturing ice cream and regulations which will prevent its contamination until it is sold will go far toward relieving children from its dangers.

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*THE OYSTER.

As the oyster season is now upon us, a few words in regard to the dangers of these delicious bivalves may not be entirely out of place.

As early as 1816, Pasquier, a French physician, noticed that there was some relationship between the use of oysters and typhoid fever. His observation of facts was correct; but, not unnaturally, his explanation of these facts bore little resemblance to what we now regard as the truth. After the observations of Pasquier, the whole question of the relationship of oysters to typhoid fever lapsed, until it was revived by the English physician, Cameron, in 1880. From this time on, numerous observations were made which tended to show, more and

*Jour. A. O. A., Sept., 1912.

more positively, the fact that a close relationship exists between certain outbreaks of typhoid fever and the use of oysters.

The matter was most completely traced out in this country in 1894, when there was an outbreak of typhoid fever among the students of Wesleyan University, Connecticut. This epidemic was investigated by Prof. W. H. Conn. At that time there were seven fraternities in the University; of these three indulged in the liberal use of oysters, and in these three fraternities, twenty-three cases of typhoid fever developed. At the same time, it was noted that the students of Amherst College who used oysters also developed numerous cases of the same disease. In the investigations made by Prof. Conn, it was found that the oysters used by both colleges were obtained from water which was more or less contaminated by sewage.

As a result of Prof. Conn's investigation, it was found that the typhoid bacilli may live for a period of at least eighteen days in the gills and alimentary tract of the oyster. He also found that the typhoid bacilli may live in sea water for a period of from three to five weeks, and that in cockles, the typhoid bacilli may live indefinitely and multiply.

Sewage is not the only way in which these mollusks may become infected. It is to be remembered that there is a possibility of their becoming infected from the hands of those who pack them and from the various processes which they may undergo while being prepared for shipment. Dr. Boyce, of England, recently made a careful investigation of 140 oysters, taken from the open market, and he found that of this number 104 were infected with the bacillus coli. It is needless to say that if the sewage from which these were infected had contained the bacillus typhosus, they might equally as well have been infected by this extremely dangerous organism.

As cities multiply along the sea coast, and upon rivers discharging into the ocean, and as they increase in size, the possibility of infection continually increases, and public safety will more and more demand the careful inspection of oyster beds. In tracing the history of typhoid fever cases, the physician should not fail to recognize the possibility of oysters being the source of infection.

One part of the price we pay for increasing knowledge is an increased appreciation of the vast amount of unexplored territory that lies all about us.

*HEALTH NOTES.

Health is natural,—disease is unnatural, and it always comes as the direct or indirect result of wrong living. Sometimes this wrong living has been by parents, or even further back than that; but the greater part of ill health and disease comes from wrong living on the part of the individual.

We are living in an age of bargain hunters,—we all want something for nothing. We want to live regardless of the laws of our being, and then we want the doctor to give us some kind of a pill, or some kind of a "treatment" which will make us as we would have been had we lived sane and proper lives. Fortunately or unfortunately the doctor is unable to give either pills or treatment which will accomplish the results which we want. Medicines and "treatments" of various kinds may more or less obscure symptoms, but they can never take the place of right living. Moreover we must learn that there is no such thing as a "cure," in the sense that recovery comes from conditions outside of the body. By way of illustration let me say that if the victim of a broken bone could avail himself of the combined wisdom of all the doctors and surgeons in the world, their combined wisdom would not be able to effect a "cure,"—all that they could do would be to properly adjust the broken bones to each other, and hold them in place in such a way as to least interfere with circulation, and then instruct the patient in regard to personal hygiene. If the bones should ever unite with each other, it would be from causes which are internal to the body of the patient. This perfectly obvious statement is just as true in regard to the more obscure diseases, as it is in purely surgical cases,—in every case the source of recovery is inherent in the body of the patient, and in order that this source may be at its best the patient must live a hygienic life.

No tonics or stimulants can ever take the place of proper hours and sane hygienic living. When people at large shall fully realize the truth of this, and that the matter of health is largely in their own hands, it will produce a healthy and normal sense of responsibility, which will go far toward keeping them from doing foolish and unreasonable things. It seems impossible to impress too strongly upon every individual the great fact of his own responsibility, that there is no such

*So. Pas. Rec., Dec., 1912.

thing as anyone doing for us anything which is of very much advantage to us.

If people are going to be moral and are going to be of value to themselves and to others, it must be through no hocus pocus of imputed righteousness, but through a deep conviction on the part of the individual of his moral responsibility, and if he is going to be well, he must rely upon a strict and careful observance of the laws of health, rather than upon anything which even the wisest physician can do for him.

*HIGH HEELED SHOES.

A visit to any of the large shoe stores is enough to convince one who has a knowledge of the structure of the human body that the shoes which are most in demand are extremely destructive to health. A prominent shoe dealer in Los Angeles, with whom I had conversation a few days ago, told me he felt sure that less than 1 per cent of the women who came to his store purchased shoes in which heels and general shape were in harmony with the requirements of the human foot.

The modern shoe demanded by fashion is not only destructive to the foot, but is almost certain to produce physical conditions of the body which are incompatible with good health. We marvel at the absurd customs of the Chinese women in bringing about the deformity of the foot, but so far as general health is concerned one would better bind the foot in harmony with the Chinese custom than to wear the modern American shoe. The Chinese custom was undoubtedly destructive to the feet, but it produced little effect upon the general health; whereas our modern shoes are laying the foundation for prolonged invalidism.

If people would wear reasonable clothing throughout, live upon a simple diet, sleep in well ventilated rooms, and insist upon good public sanitation and avoid late hours, three-fourths of the doctors in the land would be trying to find something to do. Most of the ills from which we suffer are those we bring upon ourselves, either by our excesses or by dictates of fashion.

Whatever its physical explanation may be, daydreaming is a most injurious habit, and should be checked by everyone who desires to preserve the power of healthy and vigorous thought.

*So. Pas. Rec., June, 1909.

*HOW SICK PEOPLE GET WELL.

A very clear article on "How People Get Sick" was presented in these columns last week. This week I wish to present some thoughts as to how people recover their health when they are really sick. Sickness always represents an abnormal condition of the body, and as a general thing an abnormal condition of the mind accompanies this. By an abnormal condition is meant a swinging away or moving away from the normal or usual condition; and, fortunately for us, there is a strong tendency on the part of all organized beings to swing back to the normal condition when for any reason the organism shall have passed into an abnormal condition. This may be not inaptly compared to the tendency of a pendulum to swing back to the middle point, when it is carried away from this in either direction. This tendency to return to a normal condition is so strong that in the great majority of cases persons who have not passed the meridian of life will eventually swing back into normal condition, whether they do or do not have medical attention.

The tendency to return to the normal condition may be prevented by a number of physical conditions, as well as by some mental conditions. For instance, some bone may be more or less displaced or subluxated, as it is technically called. This displacement of the bone may be of such a character that it will not return to its normal condition without artificial aid; and the displacement may not only result in local inconvenience, but may bring about a general disturbance of the entire system. It is not very unusual for some of the vertebrae which form the spinal column to become somewhat displaced. Not only is there a certain amount of local soreness produced by this, but the entire system may be disturbed by the pressure which these displaced or sub-luxated bones exert. What is true of a subluxated bone in this region is also true of subluxated bones in many other parts of the body. Anything which prevents a free return of the blood to the heart may result in disorder. Thus, bandages, or tight clothing of any kind, may act just as contracted muscles act to render the return of the blood to the heart difficult, thus causing it to unduly accumulate in the veins until the walls of the veins become ruptured or very greatly stretched.

The life of the body consists of the sum of the activities of the cells of which the body is composed. Anything which interferes with

*So. Pasadenan, Sept., 1903.

the normal action of the cell of course interferes to just that extent with the normal action of the whole; and anything which prevents the cells from freely receiving their nourishment, and from being normally stimulated by nerve action interferes with their functional activity.

There is little danger of our over estimating the influence of the mind upon bodily function, providing we bring to bear in our investigations along this line the result of careful and accurate observations. This being true, it follows that we must regard the mental attitude of the patient as an important factor in his recovery from disease. If the patient is of cheerful disposition, full of interest in life, with faith in his physician and in himself, his recovery is very much easier than when some or all of these elements are lacking.

More than forty years ago Dr. Oliver Wendell Holmes expressed the opinion that by far the largest number of diseases which physicians are called to treat will get well at any rate, even in spite of moderately bad treatment. That of the other fraction, a certain number will inevitably die, whatever is done. That there remains a small margin of cases where the life of the patient depends upon the skill of the physician.

Whatever the disease may be, or whatever system of treatment is employed, the first requisite for a return to health is for the patient to live in a strictly hygienic manner. This means fresh air and plenty of it. The sleeping room must be thoroughly ventilated. The patient should drink freely of pure water. The less a patient eats, the better off he is likely to be. There is little danger of a sick person's "losing strength" from not eating. There is much more danger of his suffering from digestive troubles caused by overeating.

Doctors do not "cure" the sick. They get well because of the tendency to return to normal conditions already mentioned, and this tendency may be strengthened to a greater or less degree by the care and advice of a competent physician.

There is a broad selfishness that closely touches the broadest generosity. For when one thoroughly understands the root of his own best good and greatest happiness, he finds it to grow from the things which make for the best good of the community in which he lives, and of the people with whom he is associated.

*THE STATE AND THE INDIVIDUAL.

Responsibility must ever be measured by opportunity and the language of good works is the truest expression of gratitude. The responsibility of the individual is two fold. First, he is so closely linked to other members of society that his failure to discharge his obligations aright necessarily hinders others in the performance of their duties and his success is greatest when it most helps others to succeed. Second, and most important, is the duty of the individual to posterity. We are the heirs of all the ages, and only life tenants of the earth. Our most solemn duty is to conserve our heritage and transmit it, somewhat augmented, to those who are to follow. Our advantages are founded upon the self-sacrifice and courage and devotion of those who have preceded us, and we can only show ourselves worthy of this rich heritage by carrying it as long as we can, adding to it while we may and delivering it into the hands of those who are to follow us.

This can only be done by men and women with sound bodies, and health can only be maintained by those who avoid all excesses. Not only must we avoid the excesses which are commonly recognized as evil, but also those which usually escape attention. Late hours, over-eating, imperfectly ventilated rooms are all incompatible with the life of a person who would constantly live up to his best. It is more important for us to keep well than it to get well. A knowledge of hygiene is worth more to us than a knowledge of medicine. It is impossible for us to separate the intellectual nature from the moral nature. The good man is one who knows what is good as well as one who is willing to do what is good. It was said of old that as a man thinketh in his heart, so is he, and no one can think aright without a proper intellectual foundation.

There is an important time in one's life, a time which comes usually between 12 or 13 years of age and the early 20's, when the nervous system is undergoing rapid development. It is at this time that the nerve cells are coming into new and remarkably complex relationship with each other; a time when paths of action are being developed in the central nervous system; a time when the individual responds most keenly to all external stimulation; a time of all others when he should be kept from all unnatural and irrational excitement. At this time in his life every emotion should express itself in action. There is no time in life so favorable as this time for inculcating in the individual a real love for the truth and the habit of being doers and not mere hearers. The only thing we need fear is the consciousness of not having done our best.

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*Thanksgiving Address, South Pasadena, Nov., 1908. From So. Pasadenan.

*USEFUL VS. USELESS INDUSTRY.

It is a common mistake to assume that because an industry requires a large outlay of capital, and because it employs many laborers it is necessarily beneficial to the community and to the nation at large. As a matter of fact any industry is to be judged by the same standard which we would apply to an individual, namely, its results. If millions of money and scores of laborers are employed in the development of an industry whose results are valueless, that industry as a whole is detrimental to society, and the greater the amount of capital employed and the greater the pay-roll of the employes the greater is the harm which results from it. A good many people and a good many newspapers that should clearly recognize the truth of the foregoing statement are objecting to any restriction being placed upon the production of California wine because of the great amount of capital involved in its production, and because of the large numbers of men employed in producing it.

As I have already stated, these facts have nothing whatever to do with the merits of the question. If California wine, or any other wine, is necessary for our people, or if in any way whatever it materially aids in our advancement, then of course whoever produces it is contributing to the welfare of the state, but if its effects are upon the whole injurious, and if society in general would be better off without it, then instead of the great amount of capital invested and the great number of men employed being an argument in its favor it is one of the strongest possible arguments against its use and in favor of all rational restriction.

If some insane capitalist should gather machinery and men for the purpose of heaping up sand on the seashore, we certainly would not feel that he was aiding in the slightest degree to the wealth of the state, although he might invest large sums of money in machinery and his payroll might show that he was distributing large sums of money every week or every month. However evident it would be to us that industry of this kind is wholly non-productive, it would not, on the other hand, be particularly harmful, and the worst that we could say of it is that it is a complete waste of the time and energy of the men directly and indirectly employed in furthering this industry. But if he should employ his machinery and men in spreading the sand upon our highways we would readily say that not only is his industry useless, but that it is absolutely harmful to the community.

If it is true that wine lessens the efficiency of the human race, then

*So. Pas. Rec., Nov., 1913.

it is true that every acre of land upon which grapes are raised for the purpose of producing wine, every laborer employed directly or indirectly in its production is not only a waste of the land and of the time and energy of the laborer, but that both are worse than useless to the extent that the wine produced lessens the proficiency of the citizens of the state. If it is true that the use of the wine is deleterious, then it is true that the state would be far better off if the land used in producing grapes should be allowed to relapse into wilderness and the state could far better afford to pension the men engaged in the wine industry and have them live in absolute idleness rather than have them engage in work the results of which are disastrous to the community.

One reason why the fertile slopes of the Atlantic seaboard are not more useful to us is because of the great tobacco industry. Tens of thousands of acres of land which might produce useful foodstuffs and clothing, land which might be producing magnificent forest timber, is now employed in the production of tobacco. Thousands of men whose labor might be employed in producing those things which would add to the comfort and safety of society are now engaged in producing that which is, to draw it mildly, useless.

I am not, at the present time, entering into any discussion as to whether wine and tobacco are useful or necessary or not useful and necessary, but I do desire to call attention very clearly to the proposition that no industry has any claim upon us simply because it gives employment to laborers. Before any industry can have any claims upon us whatever, it must be shown not only that it represents the investment of capital and the employment of labor, but that the products of the industry are beneficial.

It is possible, perhaps, to class the results of nerve cell action into two groups: emotions and actions. The former are primarily of use to the individual, and affect the outside world only as they stimulate motor centers and thus become changed into the second group. It may not be out of place to express my personal opinion that any excitation of emotion which does not find expression in action is injurious to the person thus excited, and that this is especially true in the case of young people.

*YOUNG PEOPLE AND TOBACCO.

Our public schools and our high schools have resumed their work for a new year and there is a widespread feeling, not only on the part of parents and patrons, but on the part of the public in general, that students should be held to the highest standards in their work.

If this is going to be done, it means that students must be in the best physical condition, and this can only be when they live sane and normal lives. During the high school stage of development, both boys and girls are subject to an unusual number of temptations; this is due in part to the fact that they begin to assume some personal independence, at a time when they have had very little experience in life to guide them. But it is also due in part to the fact that the nervous system is at this time of life, in a particularly upset and chaotic condition. It is during this period of life that they pass from the condition which characterizes the child to the condition which characterizes the adult. With the nervous system naturally in this unstable condition, we need not be surprised that the boy or girl is particularly sensitive to anything which may act as an irritant.

If children are to pass from this stage into a healthy and vigorous young manhood and young womanhood they must not be deprived of the necessary amount of sleep. During this period of their lives, evening parties with their artificial excitement and the character of food which is usually served, are particularly out of place. It is perfectly proper for young people passing through this stage of development to have social amusements, but it would be much better if all social functions could take place during the daylight rather than during the first half of the night.

Whatever we may think of tobacco for the adult, the fact remains that it is terribly destructive to the undeveloped, growing boy. Personally I believe the effects of tobacco at this time of life to be worse than the moderate use of alcoholic liquors. For not only does it upset the nervous system and digestion, but it breaks down the finer sensibilities, and in that way is destructive to the moral fibre. No human being should willingly fetter himself with a habit of any kind. There is probably not one habit connected with the nutrition of the body which is not more or less injurious. I have no intention at this time to discuss tobacco from an economic standpoint, but I do earnestly feel that

*So. Pas. Rec., Oct., 1912.

boys who become habituated to its use are carrying a handicap which will seriously interfere with the success in life which otherwise might come to them.

No kind of tobacco is more dangerous than that used in the cigarette, and unfortunately, this is the form of tobacco most popular with boys. Educators and physicians all over the world are calling attention to the appalling effects of tobacco on the growing boy and are pointing to the fact that he is inferior in every respect to the boy free from this habit.

There is good reason to believe that the evil does not end with the generation acquiring the habit. The descendants of those who have injured their nervous systems in youth by drugs of any kind are never as healthy and vigorous as are those who come from a stronger ancestry. The ranks of the neurasthenics, the incompetents, the inefficients of all kinds are largely filled by the offspring of parents who failed to lay the foundation of a well developed nervous system in youth. If these views be true, and the best thinkers and closest observers believe them to be true, then we owe it as a duty not only to the present generation but to the future, to do our utmost to root out a habit so injurious.

The united efforts of parents and teachers can go far, not only toward helping those not too deeply in the toils to break the habit, but what is even more important, to keep others from becoming the victims of a habit which has nothing to commend it, and everything to condemn it.

No person is safe, either physically, mentally, or morally, so long as he consciously directs the important issues of life. Safety comes only when one has decided the question correctly so many times that the unconscious centers have become habituated to act in the right way, and they do so without direction from the conscious centers.

The training for life should educate the subconscious centers to act in the right way, so that when one is suddenly called upon to act he will unconsciously choose the right. When the subconscious centers are thoroughly trained one seems to be deprived of the power of choice. And it is then only that one can be truly safe. There is no such thing as being "safe from temptation." To be "safe" there must be no temptation. And we may well barter the power of choice for the certainty of rectitude.

*LATE HOURS.

We are as a people too much given to having evening entertainments. If this is bad for the adult, as I certainly believe it is, it is little short of destruction to children, and especially to boys and girls at the High School age. Every period of our lives from birth to death may properly be regarded as a critical period, but some of the stages through which we pass are much more critical than others. This is especially true during the period of adolesence, or that time in life extending from the early teens to the early twenties, when the individual is changing from childhood to manhood or womanhood. Every part of the body at this time is deeply affected. The growth is, as we know, particularly rapid. The cells of the body are dividing at so rapid a rate that a description of their reproductive powers would hardly be credited. This means a terrible drain upon the vital energies of the body. When it is remembered that the child not only has to meet this demand upon his system, but also to provide for the ordinary activities of the body as expressed in his daily play and work, it is easy to see that when there is added to this inevitable strain that of the loss of sleep and unnatural excitement there is serious danger of over taxation which will result disastrously.

Not only is rapid growth taking place, as before stated, but the entire nervous system is in a singularly chaotic state. New combinations of nerve cells are continually taking place and enormous numbers of cells which have lain dormant during his entire life up to this period now spring into most rapid development. If proper nervous combinations are to be made the child must at this time of life be saved from all unnatural and abnormal excitements. Loss of sleep and unnatural excitement during this formative period in life are manifested later in life in the form of hysteria, neurasthenia and general mental debility.

If boys and girls are to grow into strong, sane, well-balanced, coolheaded men and women, they must at this formative period have plenty of nutritious food and plenty of sleep, the latter in thoroughly ventilated bedrooms, or better still, in the open air. The number of alcohol users and of drug fiends in general would be in my judgment greatly diminished if boys and girls grew up with sound, well-developed bodies. In perhaps a majority of cases the man or woman is driven to the use

*So. Pas. Rec., April, 1909.

of stimulating drugs or drinks by a feeling of weakness which comes from an imperfectly developed nervous system.

To make my meaning perfectly clear I will briefly say that I believe that all entertainments for young people, and entertainments in which they participate, should be concluded by or before early supper time, and that if parents would rigidly insist upon children not attending exciting entertainments of any kind, and upon their being in bed not later than 8:30 or 9 o'clock every night, we would give to the next generation a far better class of people than we at present have, and that criminality of all kinds would be greatly diminished.

The High School age is pre-eminently the age in which to impress upon the child a deep conviction of his duty and responsibility as a member of society, and the less his attention is called at this period of life to rewards, either here or hereafter, for probity and honesty and all that goes to make up true manhood, the deeper is likely to be the real moral worth of his character.

In our public schools we manage to teach almost everything except the most important thing which all of us should know, and that is how to care for ourselves in such a way that we can best meet and discharge the obligations which life imposes upon us.

The word "doctor" originally meant teacher. The physician of the future will be the doctor who will give his patient instruction which will make it possible for him to dispense with the services of a doctor. When the doctor attends the same patient for acute disease over and over again it is evident that there is a wrong somewhere. Surely the doctor does not properly teach his patient how to keep well, or the patient does not learn his lesson.

In our city, and all other cities, too much attention cannot be given to public hygiene. Our freedom from disease is due to our reasonably good water, reasonably good household sanitation, and I believe especially to our well oiled streets, which are largely free from dust, and numerous unoccupied lots. The latter condition will change as our city becomes more populous and houses are built closer together, and if we are still to preserve our reputation for healthfulness it must be because public hygiene keeps pace with the increase of population. This can be done only with the intelligent co-operation of our citizens.

*VENTILATION.

Dr. W. A. Evans, commissioner of Health, of Chicago, recently delivered a lecture on Ventilation in Schools. Much of his lecture applies quite as much to offices and other places of assemblage as to schools. In this lecture he called attention to the fact that good air and sunlight are necessary for health and vigor during the entire life, but that the need of this is especially strong during the school period of life. There are tremendous changes which take place in the body between the ages of ten and twenty, and if, during this time, the health of the child is allowed to sink very far below par, it is difficult for him to fully recover later in life. It is during this time that many of the habits of life are established, and the eye and other organs of the body are assuming a permanent shape. If the child during this time is under serious strain of eye or brain, he may not immediately show the effect, but at a later time in life he is almost certain to suffer seriously.

Many schools and offices are heated by hot air and in many cases the air thus heated is too dry for health. In many public buildings it is assumed that if from twelve to eighteen hundred feet of air for each person is pumped into the room, the ventilation is good. This does not necessarily follow unless the size of the room is such that each person has from four to six hundred cubic feet of air space. Then, too, it often happens that where the initial air volume and where the amount supplied each hour is all that can be desired, the air is too dry. Where this is the case children as well as adults are likely to suffer from colds and from large glands and tonsils. It also encourages mouth breathing, and children become pale, flabby, nervous and frequent sufferers from headaches.

The ideal school room of the present time is narrow; indeed, some architects advise that it should not be wider than twice the distance from the top of the window to the floor, and experience is showing that extensive height in the room is not good. It is highly probable that a room nine feet in height is better, all things considered, than one that is twelve or fifteen feet in height.

The evils which come from imperfect ventilation can be divided into two general groups: The first group includes the infections which come from breathing air polluted with bacteria, and the other group includes the evils which come from the condition of the air itself. Among the diseases which probably come from the air may be mentioned in-

*West. Ost., Dec., 1911.

fluenza, common colds, cerebral spinal meningitis, anterior poliomyelitis. In all these diseases the bacteria are undoubtedly transported considerable distances. The bacilli of pneumonia and tuberculosis probably cannot be carried any considerable distance by the air. Bad ventilation in and of itself produces drowsiness, headache, lassitude and sometimes far reaching effects upon the system, including anemia, chlorosis, chorea and more or less mental degeneration.

Many unsuccessful efforts have been made to discover pathogenic bacteria in the air. These efforts by no means prove the absence of the bacteria. Time and again it has been found impossible to isolate pathogenic bacteria from water and from milk which are positively known to be in condition to carry disease. Experiments have been made by filling the mouth with harmless bacteria and then determining to what distance they mày be carried, where the air is quiet. These experiments have demonstrated that twenty feet is about the greatest distance to which bacteria may be carried in quiet air. Some experiments have shown that where a person is breathing quietly in a close room that the air immediately surrounding the body is somewhat freer from bacteria than is the other air in the room. This is due to the fact that the bacteria which are inhaled are for the most part retained in the respiratory passages of the body. In all cases where it is possible, water should be evaporated in rooms heated by hot air. Windows should be frequently raised and air from the outside allowed to circulate through the room. Every effort should be made to diminish the amount of dust which is found in the air. The regulation of light is frequently afforded much better where curtains roll up from the bottom of the window than where they are dropped from the top. Of course, many of these details involve some time and sometimes the expenditure of money, but time and money that are expended for the development of health is a good investment. Every generation should try to do all in its power to make conditions better for the generation which is to follow, and they can leave them no better inheritance than healthy, vigorous bodies.

It is a matter of minor importance to decide who is right; the thing which concerns us is to decide what is right,—that is, what is true. The truth is the thing to search for; whether one or another found it is an extremely small matter.

*PLAY GROUNDS FOR CHILDREN.

While I was in Minneapolis attending the National Osteopathic Association last summer, I stole away from some of the interesting sessions to visit points of interest both in Minneapolis and St. Paul.

Of the many things which impressed me, nothing seemed to me of more far-reaching importance than did the play grounds in the City of St. Paul. These playgrounds are in several different parts of the city, the largest and most extensive being on Harriet Island in the Mississippi River. All of these playgrounds are managed for the direct benefit of children, and their purpose is not only to aid in the physical development of the child, but also to aid in cultivating his moral nature, his patriotism, and to fit him for the high duties of American citizenship. These several ends are accomplished by providing the playgrounds with simple and strong apparatus, and by having the buildings substantial and attractive, and by employing policemen who are teachers rather than the conventional "guardians of the peace."

As our civilization becomes more complex, the task of developing healthy and useful men and women continually becomes more difficult. It is recognized by all thoughtful people that play has an important part in all normal development, and in order that play may be most effective, there must be suitable grounds and surroundings.

The great importance of proper development is not understood by the people at large, and among all of the various classes of public teachers, none are more fitted to impress this upon the public than are the physicians. Not only must the people at large be educated to recognize play and physical recreation as absolutely necessary for the child, but people must be educated to understand the necessity for careful physical examinations being made, which shall recognize all kinds of physical defects. In the St. Paul system the children are watched by teachers and physicians while at their play, and if they give evidence of any marked deficiency they are carefully studied, and every effort is made to enable them to overcome the defects. It is undoubtedly well to establish reformatory institutions of various kinds; it is well to help the criminal into a better life; but it is far more important to prevent the development of the criminal than it is to reform him after his criminal habits have been formed.

*West. Ost., Oct., 1909.

In the civilization of the future we shall pay much more attention to the prevention of poverty and crime and all that is bad than to the reclamation of those who have fallen by the wayside. Now is the time in our California towns, as well as in other towns, to secure ample commons, and play grounds for the future. However, expensive land may be in the present time, we may feel quite sure that it will not be cheaper in the future, and when land has once been occupied by buildings, it is no easy matter to secure it for public purposes. In all of our towns ample playgrounds should be provided—grounds that are not only large enough for the present needs, but which will be ample for the increased population of the future. Dollars spent in this way will go far towards obviating the spending of tens of dollars in the future for criminal courts and prisons. The growing boy who thoroughly enjoys hearty, active play is much less likely to develop criminal tendencies than is the boy who because of lack of opportunity for play, hangs around the corner grocery or loiters on the street corners.

Osteopathic physicians probably are making a closer study of the human body and its needs than any other class of physicians. If this be true, they should understand better than others the necessity for proper places of recreation, and they should be the leaders in the community for securing a place of this kind.

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*SCHOOL ARCHITECTURE.

Edward Hyatt, Superintendent of Public Schools of California, has just issued a book on "School Architecture" which is of very much more than passing importance. The book deals not only with school architecture, but also with the problems concerned with play grounds, school gardens, school heating, and in fact almost everything material concerning the care and training of children. The book should be carefully studied not only by school boards and teachers, but also by parents who would intelligently co-operate with teachers in the great work of properly training and developing the coming generation.

It is needless to tell the American people of the superlative value of public schools, but it is quite necessary to attempt to educate the public in regard to the dangers connected with our school system. While the schools are unquestionably efficient in producing intelligent

*So. Pas. Rec., April, 1910.

citizens, it is very often in the school that the future citizen lays a foundation for ill health which not only shortens his life, but greatly impairs his usefulness while he lives. The ill-ventilated schoolroom of the past, the free exchange of lunches among children, the common drinking cup, the common towel, the bad toilet arrangements combined to make easy the spread of tuberculosis and other contagious diseases. The unfortunate arrangement of windows permitted light to enter which made study possible, but it often entered in such a way as to seriously impair the eyesight of the child. Where poor ventilation did not actually lead to contracting disease, it often lowered the vitality of both teachers and pupils to such an extent as to prevent either one from accomplishing what he otherwise might have done.

The suggestions for the play ground which are to be found in this book will go far toward developing a healthy class of children, and the suggestions in regard to beautifying the grounds will do much towards imbuing the children with a love for the schools. Many of the most important suggestions in the book may be carried out with little or no expense. This book is strictly in line with the best thought of clearly seeing that prevention is vastly better than cure. This philosophy is pervading every department of thought, and to the extent that it takes a deep hold on our people, future generations will have fewer paupers, fewer criminals and fewer invalids. In all these cases the underlying philosophy is the same. We must in every case ascertain the cause of evil and then we are prepared to combat it intelligently.

The only way to learn to do is by doing. It is no more rational to attempt to educate young people by lectures than it would be to tell a potato plant in a dark cellar what sunshine is like, and then expect it to develop chlorophyll. Education means training, and this is only to be secured by the proper use of well fitted laboratories.

*SHALL THE TONSILS BE REMOVED?

Almost all of our large cities, and many of the smaller ones, are employing medical inspectors to examine the school children. Careful examinations are made of the condition of the eyes, ears, nose, throat, powers of digestion and other things which pertain to the ability of the child to master and assimilate his school work. So far as the principle is concerned these examinations are exceedingly useful, and where the work is wisely done many children who have in the past been considered stupid and inefficient have their defects pointed out and remedied in such a way as to enable them to become efficient workers. Where the work is not wisely done serious results may follow. So much advancement has been made in the application of surgical methods that there is serious danger of the physicians advising surgical work where such work is really not entirely necessary. Owing to our imperfect knowledge of physiology it is quite possible that we fail to appreciate the full importance of some organs. Among those whose real importance may be underestimated are the tonsils. The full significance of these organs can only be appreciated after one has made a careful study of the organs of respiration. The trachea and all of its branches even to the ends of the respiratory bronchioles are lined with ciliated epithelial cells, and the cilia all move in such direction as to force a thin layer of mucous from the branches into the trachea and through the trachea up to the pharynx. This mucous is secreted by the epithelial cells lining the above mentioned air passages. A careful study of the air and the nature of respiration shows the valuable work accomplished by this upflowing current mucous. If respiration is carried on through the nose as it should be all of the coarser dust particles of the air and many of the bacteria are strained out of the air in its passage. Most of the dust and bacteria passing through the nose and entering the trachea is caught sooner or later in this ascending current of mucous and thus the lungs are partially freed from danger of infection. This mucous is discharged from the trachea into the lower portion of the pharynx in close proximity to the tonsils, and from there it from time to time passes down through the esophagus to the stomach where the bacteria are at least in part destroyed by the action of the gastric juice. From what has been said it will be noted that the lower portion of the pharynx must always contain large numbers of bacteria.

The tonsils are composed of what is known as adenoid tissue, which

*West. Ost., March, 1909.

upon the whole very much resembles lymphatic glands. Tissue of this character is distributed through almost the entire length of the alimentary canal, and one of its functions is to repel and destroy bacteria which otherwise might penetrate the epithelial lining of the alimentary canal and thus bring about an infection of the underlying connective tissue. Nature seems to have developed the tonsils in response to this danger of bacterial infection, and when they are incapacitated for action either because of their extirpation or from their pathological condition bacterial infection of this region becomes a comparatively easy matter. The tonsils are well supplied with blood because of the activities which are demanded of them, and, like other organs having a large blood supply, there is always a possibility of their becoming congested because of imperfect drainage. If this condition is allowed to become permanent, the condition of the tonsils may become such that their extirpation is necessary. But if the great importance of these organs is understood they would receive proper care before so disastrous an operation is forced upon the patient.

It is truly remarkable how readily inflamed tonsils yield to intelligent osteopathic treatment. Perhaps another reason why the tonsils are especially subject to disease is because they are in a part of the body which has undergone profound modification during embryonic and foetal development. A careful study of the pathology from the standpoint of embryology is sufficient to convince us that those parts of the body which have been most profoundly modified during foetal development are the parts which are the most subject to disease.

It is of course quite conceivable that the tonsils may become so seriously diseased that their surgical removal is the only solution of the problem. The same thing may be said of the right hand; but just as the intelligent person will take such care of his hand as to save it from the possibility of amputation, so will the intelligent person care for his tonsils and for the tonsils of those who are dependent upon him. Before the physician advises the removal of tonsils he should fully understand the great physiological importance of those organs, and he should be sure that they are so diseased that no treatment will enable them to recover, and again assume their normal function of preventing the bacterial infection of the connective tissues of the throat. It is highly probable that many cases of tuberculosis of the throat are due either to the surgical loss of the tonsils or their inability to perform the physiological functions which nature has imposed upon them.

*THE GONOCOCCUS

I believe there is a misapprehension in regard to the nature of gonorrhoeal infection. It is true that blood is a good germicide. It is perhaps the best there is in the human body. The gonococcus lives upon the mucous surface, that is, upon the epithelial cells, and there is no circulation of blood in the epithelial cells, hence the gonococcus is entirely away from the possible influence of the blood or any portion of the blood. What the blood can do, as I understand it, is by good circulation to keep the deeper tissues in a healthy condition. It is possible by increasing the circulation through those parts to make the production of epithelial cells more rapid than would be possible without a good circulation. The gonococcus lives either inside the pus cells or in the epithelial cells. In either case it causes the death of the cell. The epithelial cell by its desquamation carries off the gonococcus and to that extent frees the part from infection. If there is good circulation through those parts so that there may be a rapid reproduction of epithelial cells it is possible to produce natural cells which, of course, are not infected, and in that way very materially aid in reducing the infection. We would stultify ourselves in the eyes of those who know if we should talk about the blood destroying a gonorrhoeal infection.

I wish to emphasize the fact that the best possible circulation in the heart could not possibly destroy a gonorrhoeal infection. In order to be removed it must be done by antiseptics which will destroy the bacilli, making it possible to build up new tissue, and make it healthy.

When we make an examination of infectious disease of the urogenital tract and find a diplococcus present it is not by any means certain that the diplococcus is a gonococcus. It is sometimes difficult to prove that a diplococcus is a gonococcus. If it is one of those cases which seems to yield readily to treatment, and where there is little or no tendency to a relapsed condition, it would seem to me to be pretty good evidence that that special diplococcus is not a gonococcus, because the gonococcus seems to be especially virulent, and while I am not prepared to say that the cure is an absolute impossibility, I am prepared to say from a knowledge of many cases where I have made the laboratory examination, that the cure of true gonorrhoea seldom or never is effected.

Another thing which we must remember is that there is a very

*Discussion, A. O. A., 1910. Pub. in Jour. A. O. A., Feb., 1911.

great difference between the gonorrhoeal attack in the male and the female; that a gonorrhoeal infection of the female is very much more dangerous than a gonorrhoeal infection of the male; that the urine passing through the urethra being sterile has a tendency all the time to wash out the gonococcus from the male, and it is possible that there are a good many cases of incipient infection which may be cured in that way without much of any treatment. When I said I did not believe it was cured I meant if it goes into the deeper glands of the urethra. But in its incipiency it is quite possible that the sterile urine in washing over it may effect a cure. You know that is the German army treatment of the disease. The patient is compelled to drink until there is a very large secretion of urine which passes through the urethra, and certainly in many cases it appears to either cure or relieve. In the case of the female, where the infection is in the vagina, and where it moves toward the uterus, it is obvious that there is nothing which tends to relieve that situation; that the tract being entirely free from the kidney secretion cannot be helped in the same way in which the disease in the male can be helped.

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*HOW LONG SHALL WE LIVE?

Almost every one is familiar with the scriptural statement that "the years of a man's life are three score and ten," etc. Very few people seem to be familiar with the fact that Moses said the Lord told him in a face-to-face conversation that man should live one hundred and twenty years. We are strongly of the opinion that the human race would be much benefited could they familiarize themselves with this latter statement. The "three score years and ten" doctrine is so thoroughly ground into the minds of people that they are unconsciously hypnotized into old age at about that period. Were we all imbued with the idea that when we have reached the age of three score years and ten we yet have fifty years of life before us, we believe that the human race as a whole would be much more effective. It seems a little strange that the statement of an unknown poet should appeal to us with such force when the direct statement attributed to Jehovah makes so slight an impression upon us. We have no desire to engage in theological discussions, but we ask our readers to seriously consider the advisability of teaching people that three score years and ten does not necessarily end a man's period of usefulness.

*So. Pas. Rec., Dec., 1918.

*OLD AGE.

In 1904 Dr. Elie Metchnikoff delivered a lecture before one of the learned societies of Paris on the subject of old age. In this he discussed the factors which bring about this condition. In this brief paper I wish to present an abstract of his lecture, and shall take the liberty of adding to it a few thoughts which have developed since the time that the lecture was delivered.

The problem of old age is a difficult one to solve—in fact, no one ever knows exactly when it begins. Some of the characteristics are a dry skin, more or less wrinkled, usually pale, hair white, body bent, slow walk, defective memory. In the minds of many people, baldness is associated with age. This is by no means a characteristic of that period of life, as many people lose their hair while still in the full vigor of life. Experience rather indicates that if a person does not begin to lose his hair in early life, he is not likely to be bald in age.

The status of old people in society is by no means uniform. Among savages it is not unusual for the aged to either be exposed to conditions which will certainly result in death, or for them to be absolutely killed. Among some of the African tribes it is not unusual for the aged to be buried alive. Among less cultured people, love of life frequently increases with age.

As old age comes on, there is frequently a marked disintegration both of the skeleton and of the muscular tissues. This disintegration necessarily results in a weakening of the individual and in making him much more liable to accidents. No one did more than Virchow to investigate this tendency towards degeneration, and it seems an irony of fate that he should die at the age of eighty-two as the result of an accident due to this degeneration. As age advances, some of the cells of the body seem to lose their power of reproduction and, strangely enough, the reproductive powers of other cells seem actually to be increased. The cells which lead to the production of the nails and hair of the head seem to retain their reproductive power without much variation. The epithelium cells of the kidneys, the liver and probably the other glands of the body lose their reproductive powers to a great extent, but the cells which produce hairs on the face frequently become more active as age advances. This is much more marked in some races than in others, and

*West. Ost., Nov., 1913.

more marked in the female than in the male. Many Mongolians are without beard until late in life, when the beard grows with some luxuriance, and it is not unusual, even in our own race, for the female face to have the down of early life replaced by well-marked hairs late in life.

The destruction of the tissues of the body seems to be brought about by the development of cells closely related to the white blood corpuscles. These destructive cells are known as macrophages. These macrophages not only attack the tissue cells of the body, but they destroy the pigmentation of the hair and skin, leaving one pale and causing the other to turn white or gray. Macrophages may be due to toxins as well as to advancing years. It is not unusual for those engaged in smelters to undergo senile degeneration early in life. The same is true of those who are exposed to the dangers of poisoning by phosphorus. It is also probable that the development of macrophages may be due to autointoxication produced by excessive putrefaction in the alimentary tract. It is probable that toxins produce anti bodies, which at least partially neutralize the injurious effects which the toxins might otherwise execute. It is a curious fact that birds age much less readily than quadrupeds. This is true when birds and quadrupeds of the same size are compared with each other. Birds whose weight is about the same as that of mice live from three to five times longer than do mice, and nearly the same proportion is observed when larger birds and larger quadrupeds are compared with each other. Metchnikoff attributes the longevity of the bird to the fact that it has no large intestines, and hence there is not the opportunity for intestinal putrefaction which is found in mammals. The alimentary tract of mammals, and especially the large intestine, is remarkably rich in its bacterial content, while the alimentary canal of the bird is singularly free from bacterial inhabitants. Metchnikoff suggests that the evil effects of bacteria in the human being may be in part overcome by inoculating the alimentary tract with luxuriant growing bacteria, which will destroy the toxin producing bacteria and thus prevent the formation and absorption of deleterious products into the circulation. He believes that the lactic bacillus is, on the whole, one of the most practical for this purpose, and he would have people inoculate themselves with this organism by the use of curdled milk, in which it is growing abundantly. He would also have people avoid reinfection of the alimentary canal by avoiding all uncooked foods—radishes, lettuce, and most kinds of fruit are well covered with bacteria, and, according to his idea, these should be eliminated from the food list and cooked food should be substituted for these. In his lecture, Dr. Metchnikoff quoted the following rules of health from an aged physician of London by the name of Dr. Weber:

"All the organs must be preserved in a state of vigor. Morbid tendencies, whether hereditary or acquired during life, must be recognized and combated. Moderation must be used in the consumption of food and drink as well as in the pursuit of other corporeal pleasures. The air within and about the dwelling must be pure. Corporeal exercise must be taken daily in all conditions of weather. In many cases it is also necessary to take respiratory exercises as well as to walk and climb. One must retire early and rise early. Sleep should be limited to six or seven hours. Every day a bath should be taken, or the body well rubbed. The water employed for this may be cold or warm, according to individual temperament. Some times warm and cold water may be alternately employed. Regular work and intellectual occupation are indispensable. The mental attitude should be that of enjoyment of living, tranquility of mind, and hopeful conception of life. On the other hand, the passions and nervous disturbances of sorrow should be combatted. Finally, one should have a firm determination that will compel the preservation of health, the avoidance of alcoholic liquors and other stimulants, as well as narcotics and analgesic substances."

It would seem improper to close even this brief synopsis of Dr. Metchnikoff's lecture without reminding the reader that age has its uses as well as youth. It really seems that the contempt which many people have for the aged is based upon traditions which have come down to us from the time when the principal business of man was to engage in war. In extreme age it is undoubtedly more difficult to memorize facts than it is earlier in life, but with age there may came a calmness of thought and a dispassionate view of life which may make the counsel of the aged almost invaluable to the world. Among women, especially, it seems to be true that with the approach of age there comes a breadth of thought and of sympathy which is entirely unknown to the young woman. The best intellectual work is usually done by women after they have passed the forty-fifth year of their lives, and it is highly probable that as men shall abandon excesses of all kinds, their minds will become clearest after the passion and fever of early life have passed away.

The search for happiness is never rewarded by happiness; but happiness comes always and everywhere from self-forgetfulness in doing whatever useful work comes to one's hands.

*WHEN THE PATIENT DIES.

No one in modern society comes into closer relationship with another than does the physician with his patient. He is almost invariably present when we are born, and it is not considered respectable to die without his ministrations; and between the period of birth and death his services are in frequent requisition.

When a patient dies, his immediate friends and relatives are not only incapacitated for intelligent action because of their grief, but they immediately become the victims, partly of custom and partly of funeral directors, a part of whose business training has been to profit themselves as much as possible by the inability of the family to transact business in a business-like way. It too often happens that the physician is under such obligations to the funeral director that he becomes almost his silent partner. In other cases, the physician feels that when his patient has breathed his last his duties have ended.

It would be better for all concerned if the physician, moved by the impulses which should ever characterize the medical profession, should continue for a brief time to be the real friend and adviser of the stricken family. Of course, in many cases, such assistance would not be welcomed, and the physician of ordinary discretion would not proffer his services in such families. But in many cases the friends and relatives are in such a mental state as to be wholly dependent upon some one, and it is far better that they should be dependent upon a real friend than that they should be dependent upon those who wish to exploit them to the greatest possible extent.

Complaint is heard from every part of our land of the continued increase in living expenses. Some attribute this to objectionable tariff legislation; others find its cause in the action of the great trusts and commercial combinations; some attribute it to the decreasing returns of the earth; a few have hinted that the enormous size of ladies' hats may not be without effect. With as much, and possibly more, reason, I venture to suggest that one cause is the increasing expense of what is called a respectable burial. Seriously speaking, it appears highly probable that the advance in the cost of living is not due to any one thing, but is due to a combination of many causes, and the welfare of humanity demands that this cost shall be reduced.

Human feeling is such that few people have the courage to defy the common usages of society by practicing rational economy in the

*West. Ost., March, 1910.

matter of disposing their dead, and yet it is a manifest wrong to spend so much in funeral expenses that the living shall seriously suffer. I have known more than one case where the living children were forced into serious suffering because of the unnecessary expense incurred in the funeral of one dead child.

The physician can go far toward changing all of this if he has sense and tact. The mother, heartbroken over the death of her child, will seldom have the courage to count the cost of its funeral; but if she can be sustained by the calm counsel and direction of one in whom she has implicit confidence, she may be induced to refrain from expenditures which would seriously imperil living ones who are just as dear to her. I think that Roman Cato once said: "It is hard to save a city where a fish brings a greater price than an ox." Modern society is in serious danger when the cemetery is a close competitor in the matter of expenditure with the public school. To speak plainly, it is absurd to spend one hundred and fifty to three hundred dollars for the burial of some child who perhaps in years had not had that amount spent upon him for comfortable clothing and other actual necessities of life.

If a reform is to be made along this line, it must be largely initiated by physicians. Thirty-five hundred dollar burial caskets and expensive monuments have no place in a civilization in which slum districts are found in every city. So far as monuments are concerned, it may be said that in the great majority of cases they have been erected but a very few years before people seriously inquire as to who the person was whose name and fame they are intended to perpetuate.

There is a pathetic absurdity in people getting sick and calling in the doctor to help them get well. Certainly we should either smile or be provoked with the person who would each day overeat to such an extent as to make the services of a physician a daily necessity. It is almost as absurd when one shall do this at longer intervals of time. It is almost as absurd when one violates other laws of his being and so necessitates the services of a physician. In the first case we certainly should feel that either the physician or the patient was most grievously to blame—the physician to blame for not giving such instruction to the patient as to prevent his future violation of his dietetic requirements, and the patient to blame for not learning the lesson which his physician tried to teach him. In other words, the time will come when we shall see the absurdity of the whole system of modern medical practice.

*THE RELATIONSHIP OF THE OSTEOPATHIC PHYSICIAN TO PUBLIC HEALTH.

It happened once upon a time that there was a mountain, and a road ran along its side. This road was traveled by every member of the human race. For the greater part of the distance the road was fairly good, but occasionally there were places where the road was very slanting and rough and uneven, and when the travelers came to these places, it often happened that they fell from the road down the cliff. As the result of this fall, some were killed, others had their limbs broken, and all were more or less injured. Partly out of sympathy for the unfortunate ones and partly because it was financially profitable, a considerable number of kind-hearted men and women banded themselves together and at each of the places where the travelers fell, they built hospitals, and supplied them with physicians and nurses, and as soon as a person was injured he was tenderly picked up and cared for, and if he could be restored to health he was sent back to travel again, but it frequently chanced that before he had traveled very far he met with another accident, and was in like manner again cared for. At a later time in history, some one conceived the idea of building fences and walls along these dangerous places; and after these were built, the travelers were unable to fall, and often they were able to pass the entire length of the road uninjured and in safety. These kind-hearted men and women who built hospitals and cared for the injured were people even the same as you and I. The people who built the walls and fences and made it impossible for the people to fall over the precipices, were the public hygienists.

Every one of us is first and above all a citizen of our country and of the community in which we live. As public spirited citizens, everything which makes for the welfare of the community is of interest to us. It is true that professionally we are physicians. It is true that in a measure, we profit by the sickness which is in our communities; but if we do not strive to prevent that sickness, we fall far short of good citizenship.

PREVENTABLE CAUSES OF ILL HEALTH.

A large part of the sickness from which the human race suffers is to be attributed to one or more of four preventable causes: Bad air, bad water, bad food, and bad personal hygiene. If these four conditions were corrected, it would be no exaggeration to say that we could

*Jour. A. O. A., Oct., 1908.

wipe out of existence ninety per cent of the sickness from which people suffer, and death until old age, except as the result of accident, would be almost unknown.

BAD AIR.

By good air is meant air which nearly approaches the air as it is out of doors in the country. Ordinarily good air, such as we find in country places, and in the less congested parts of our cities, contains about four parts of carbon-dioxid to ten thousand parts of the other constituents. The amount of carbon dioxid may be double in air without it becoming very injurious. But if the amount of carbon dioxid is increased much above eight parts in ten thousand—then those who are confined within it suffer from headache, from drowsiness, and from a general physical depression. It is our duty as physicians, our duty as citizens, to try to see that dwelling houses, churches, and all places where people assemble, in the communities in which we live, are provided with proper ventilation. In any hall where people are assembled for any length of time, there should be about sixty cubic meters of air space for each individual, and each hour there should be an opportunity for about 100 cubic meters of air to pass into the room, and about the same amount to pass out of it, for each individual. If these conditions prevail, then we are safe in saying that we have good ventilation. If anything less than this prevails, the ventilation is not what it should be. There is a general impression upon the part of many people that bad odors are necessarily unhealthful. I am not here to argue in their favor. I dislike them as much as most persons, but the fact remains that there may be a very bad odor in the neighborhood, without the air being necessarily unhealthful, and especially are we to remember as physicians, that the worst odor in the world does not result in typhoid fever or any other specific disease. Typhoid fever and other infectious diseases come from totally different sources. The bad odors may lower one's vitality, and in that way may predispose persons to disease, but as before stated the bad odors themselves do not produce disease.

Dust is always to be regarded as dangerous for at least two reasons. One is that it is irritating to the throat and lungs and tends to bring about a congested condition of these organs and this makes it easy for persons to contract disease, but the worst feature of dust is that it is often laden with bacteria and frequently with pathogenic bacteria so that if the throat is irritated and its powers of resistance are made less by the dust, the bacteria may gain a foothold and some form of throat disease may follow. Wherever we may be it is a good plan as citizens to favor sprinkling the street and doing all that we can toward keeping the dust down.

BAD WATER.

A cup of cold water seems about as good a thing as it is possible for one person to offer another, and yet a cup of cold water, pure and sparkling as it may appear to be, may be the source of disease and grave danger. On the other hand water which looks very impure may be a reasonably safe water to drink. Public drinking cups in the cars and other public places are a serious menace to public health. All water that is contaminated by sewerage in any way is dangerous and extremely dangerous. All wells that are in the immediate vicinity of vaults may be more or less contaminated because germs of disease will ultimately pass through the ground into the water. I remember a little town in Illinois which was for years and years cursed with typhoid fever. People died by the score. It was an almost continuous scourge. The ministers used to hold funeral services and tell us how "the Lord had called this one and that one home." In later years the town put in a system of water works, and piped pure water into the houses, and from the time of the completion of the water works until the present day the number of deaths from typhoid fever has been reduced almost to zero.

The question arises as to how the physician engaged in general practice can tell whether a given sample of water is free enough from bacteria to be safe. This is not an easy thing to do, but there is a test which is a reasonably safe guide. It is performed by making a simple culture medium of gelatine, such as we use in the bacteriological laboratory, in an ordinary petri dish. After the gelatine is sterilized take a small amount of the water which you desire to test, mix it with a very much larger quantity of water which has been sterilized by boiling so as to dilute the water which you are testing and pour a small quantity over the gelatine. If in the course of a day or two the gelatine is liquefied by the bacteria which are growing in it, it is an indication of dangerous water. If on the other hand the number of bacteria which produce liquefaction is not large the water is in all probability reasonably safe. Most pathogenic bacteria with which we have to deal liquefy gelatine rapidly. The non-pathogenic bacteria as a rule do not readily liquefy gelatine.

Water companies, and those who are interested in showing that water is all that it should be often view it only from a chemical standpoint. Hygienists agree that an examination which shows the water pure from a chemical standpoint does not prove that the water is fit for drinking. Water may be bad from a chemical standpoint without being in danger of carrying disease and it may be perfect from a chemical standpoint and still contain bacteria which render it dangerous.

BAD FOODS,—MILK.

Another source of danger is in milk. I believe that infant mortality from the use of impure milk is enormously greater than most of us realize. Milk above all foods should be pure. From a chemical standpoint it should be up to a high though just standard. Ordinary cow's milk should contain about three per cent fat, three and a half per cent proteid matter, and four and a half to five per cent of sugar. Milk of this character is good from the standpoint of the chemist, but from the standpoint of the public hygienist milk must not only have these chemical characteristics, but it must be clean, and in order that it may be clean the milkers must be clean. No milk should ever be given to an infant where the milker had not carefully washed his hands before touching the cow, and in addition to that the cow should be washed before being milked. No milk is fit for an infant when there is a tubercular cow in the herd from which the milk comes. If there is a single animal in the herd suffering from tuberculosis she comes in contact with the other cows and by coughing may cause saliva and sputum rich in bacteria to be thrown upon the sides of the fellow-cows and thus into the milk. There is a question as to whether bovine tuberculosis and human tuberculosis are the same disease, but that is a question that cannot be settled at the present time; but where there is a possibility of the two being the same it is better to guard the infants and assume that the two diseases may be the same. Hence milk which by any possible means may be contaminated by bovine tuberculosis should be regarded as dangerous milk to use.

There are a number of diseases which are spoken of as milk borne diseases. As physicians and as public officers (which we are, because we are licensed by the state in which we are practicing) it is our business to intelligently trace the origin of disease. If the physician has a case of diphtheria, it is not enough for him simply to treat the case, and put the patient on the road to recovery, but it is his duty to attempt to find out where the disease came from. People do not "just get diphtheria" any more than they "just get eaten up by a lion." We are not eaten by a lion unless there is a lion around. We do not have diphtheria unless the bacilli of diphtheria are in our throats. The throat may be congested and may form a fine nidus for bacteria, but we do not have diphtheria unless the bacilli are present and it is the duty of the physician to try and find where it comes from in order that he may assist in saving others from the disease. So far as we know diphtheria is not transmitted by water, but it is very commonly transmitted by milk. If milk is obtained from a family in which some person is suffering from diphtheria it is possible for the milk to become contaminated unless the greatest care is used, and in that way the milk may become a source of danger. The same thing is true in regard to tuberculosis and scarlet fever. It is probably no exaggeration to say that in nine cases out of ten when there is an epidemic of diarrhoea or summer complaint amongst children it comes from milk, and when it does not come from milk it comes from some other article of food.

Thrush is another disease which is very commonly carried by milk. Whenever milk which must be used is suspected of being infected by any pathogenic organisms, pasteurization is the proper treatment. This is accomplished by raising the temperature of the milk to 165 or 170 degrees Fahrenheit, and then cooling it as quickly as possible. By so doing most of the bacteria in the milk are destroyed and the keeping qualities of the milk are very greatly increased.

FLIES.

Another end for which physicians as public spirited citizens should work is the extermination of the abominable dirty house fly. There was a time in the history of our race when flies were useful, when in the great cities dead cats and dogs and rats were thrown promiscuously into the streets and it was a good thing to have flies to devour the filth, but cleanly as we are endeavoring to become, the fly is a nuisance. The tuberculous patient expectorates in the street or elsewhere, and the flies almost immediately alight upon the sputum and then enter our houses and places where articles of food are kept. Flies visit sick animals and settle on the sores and become contaminated with the pus and carry it into our houses. I have known three cases of antinomycosis where the disease was almost certainly transmitted to the patient by the house fly. The flies get into the pus of the animal suffering from the disease, and then by coming in contact with some abrasion of the human skin the spores of the mold are transmitted. Flies do not just simply "come." They come from places—filthy places. Do away with the filth and with decomposing matter, and you do away with the breeding places of the flies. There are only a few flies that ever managed to live through the winter in a severe climate. Those which do live through the winter deposit their eggs in places where there is decaying organic matter and in a short time there are myriads of flies. Physicians should work for that cleanliness which will rid the country of flies, and in doing it we not only add to the comfort of the people at large, but we do much in the way of promoting public health.

BAD PERSONAL HYGIENE.

In regard to personal hygiene there is much which might be said. Plenty of sleep is necessary to health. There are a few people who can rob themselves of a certain amount of sleep and still do their daily work; but there are none who can rob themselves of necessary sleep without shortening their lives; and without lowering their efficiency as men and women. It is a good thing to live to be eighty years of age, but there is a more important thing than living eighty years and that is to live such years as we have efficiently. It is better to die at fifty and have had years of vigor than to die at ninety and to have lived the last fifty years in such poor health as to destroy one's efficiency. Long life is good only so far as we are useful. If sleep is important to mature men and women it is vastly more important to children. All reasonable influence should be exerted against evening parties for children. Entertainments of all kinds which keep children up to a late hour are not only injurious to health but are absolutely destructive. The child comes home exhausted from such places unable to sleep because his nervous system is in a quiver. As physicians properly interested in public health and prosperity we should do everything in our power to bring the next generation up to the highest state of usefulness.

Most of us respect an ancient faith whose rules of conduct are expressed in ten different commandments. The Buddhists have condensed their moral code into five commandments. One of them which should appeal to us strongly is: "Shun drugs and drinks which work the wit abuse; clean hearts, strong bodies, need no Soma juice." If we should bring up our children with the thought that all drugs and drinks which work the wit abuse are to be discarded, we would go very far towards helping them to grow into a stronger and better manhood and womanhood than they otherwise can. I think that even those who are addicted to the use of the weed will excuse me for saying that it is not good for children. I will not discuss the effect of tobacco upon the adult at this time, but children are seriously injured by it. The little boy on the streets, who at the age of six or eight or ten years learns to smoke cigarettes is doing that which makes a strong and vigorous manhood impossible, and it is our duty as physicians to make this known and to work for better conditions.

DISINFECTION.

All will agree as to the extreme importance of recognizing all cases of communicable disease and reporting them promptly to the proper officer. The physician who fails to recognize and report small pox, diphtheria, scarlet fever, measles, bubonic plague and many other contagious diseases not only makes a most serious mistake but he commits a crime against the whole community. It is customary with some physicians to report deaths from tuberculosis as pneumonia cases. This is often done to please the friends of the deceased and because it is thought that no harm can come from the deception. The evil of this is that the room and house in which the person has died is not properly disinfected and thus innocent persons may be exposed to the danger of contagion. Cases are not rare where several persons have contracted tuberculosis from living in a house in which there had been a tubercular patient and which had not been properly disinfected.

It is the duty of the attending physician in all cases of acute sickness to be sure of the thorough disinfection of the house in which the patient has either recovered or died. If there is an efficient health department in the city it is the business of the health officer to attend to disinfection, but in many of our smaller places the health department is very lax and then it is the duty of the attending physician to protect the other members of the family from contracting the disease from which the sick member suffered.

We should not be content with the development of osteopathy until we find ourselves standing shoulder to shoulder with other physicians in investigating these great problems, which are of such import not only to large areas of our country, but almost to civilization itself. That there is much work for us to do is evident when we know that we have not one representative in conferences of this kind.

Osteopathy may be hampered by mediaeval legislation, but the only thing that can ever kill it is for its practitioners to cease to be progressive. No system can rest for any length of time upon political aid. The only thing upon which we can ultimately depend for our security and our success is to be so faithful to the interests of humanity that the people shall feel that we are absolutely essential to their well-being. When, by our faithfulness, our education and our skill, we can bring about this feeling, our position is absolutely invulnerable.

*WHAT OF THE FUTURE?

Prophesying without time limitation is one of the most innocent amusements in which one can indulge. It is, of course, quite possible that the prediction will never come true; nevertheless the prophet is quite safe, because he has the indefinite future to which he may point the doubting mind.

Sir Alm Roth E. Wright has prophesied that "the physician of the future will be an immunizer." I would like to suggest the possibility that the physician of the future will be a preventer of disease rather than an immunizer. At first thought there appears to be little difference between the two, but when one analyzes the situation more closely, he sees that they are separated from each other by a great gulf. The immunizer assumes that conditions favorable for contracting disease are ever present, and so he proceeds to place his patient in such condition that he shall not become infected, or if he does become infected, that the infection shall be mild in character. The immunizer assumes that automobile speeding is inevitable, and so he proceeds to devise suits of armor which will make it reasonably safe for one to be run over by one of these vehicles. The physician who believes in preventive medicine believes that speeding itself can be stopped, and hence that the armor, no matter how efficient, will be needless.

I am inclined to believe that the best thought among physicians of all schools is along the line of preventing conditions which make disease possible rather than in immunizing patients from disease.

A recent discovery by Mr. A. J. Baldwin, of New York City, promises to go far in the line of preventing disease. For the last ten years we have known that diphtheria, scarlet fever, typhoid fever, tuberculosis, and perhaps some other diseases, are widely spread by milk, and public hygienists and technical bacteriologists have worked faithfully trying to improve the character of the milk offered for sale. The work done has led to a marvelous improvement in regard to the character of milk. Not many years ago, it was not difficult to find milk offered for sale which contained more than one hundred million bacteria to the cubic centimeter. Under improved dairy conditions, the number has in many cases been reduced to somewhat less than fifty thousand; but when one reflects that a cubic centimeter consists of only a few drops of milk, it will readily be seen that even at the last named

*West. Ost., May, 1910.

figure the number of organisms in the amount of milk which a baby would take at a single meal is so enormous as to defy the power of human conception. Mr. Baldwin claims that practically all bacterial and protozoan life can be destroyed in milk by charging the milk with carbon dioxide gas, and that when the milk is thus charged it may be transported almost any distance without deterioration. It is claimed that the carbon dioxide gas can be readily removed from the milk by simply pouring it in a thin layer from one dish to another, but that for ordinary purposes its presence in the milk is beneficial rather than hurtful. The discovery is too new to make it safe to make predictions as to its value, but if it accomplishes what Mr. Baldwin believes it will accomplish, it is one of the great discoveries of the century and it will go far toward relieving the immunizing physician of work which he otherwise might be called upon to do.

Other causes for the spread of disease are the several kinds of flies. It is quite likely that at one time in the history of the race the fly was beneficial rather than harmful. That was when people were much less cleanly than they are at the present time and when dead animals and animal filth were common in the streets of our cities. Under those conditions, the flies, by causing them to be quickly devoured, perhaps did more good than harm; but now, with our greater cleanliness, the flies have become an unmitigated nuisance. They do very little good, if any, and are certainly an important factor in the dissemination of disease. Not only does the fly spread disease from one human being to another, but it acts as a carrier of disease among both lower animals and plants. Some of the most destructive diseases to which trees and fruit are subject are believed to be spread by the fly. So far as we know, the fly breeds only where there is decaying organic matter. If this be the case, the obliteration of flies is simply a question of cleanliness.

There is good reason to believe that the hook worm plays a most important part in the reduction of the physical and mental energies of large numbers of the people in the South, and it has been reported as gaining a foothold in California. This parasite is spread solely by a lack of attention to ordinary cleanliness. Wherever sewage is spread over the ground, there is a possibility of the barefooted child contracting this disease. Even if we knew some means of immunizing against this pest, it would probably be very much better to improve our sewage systems and sanitary conditions than to practice immunization. The methods of preventing malaria are known perfectly well, and it is simply a question of expense and judgment as to whether we shall make use of these means or suffer from the ravages of the disease.

When the institution of chivalry was at its height in the very flower of its glory in the latter part of the sixteenth century, Cervantes wrote Don Quixote. The book was interesting and amusing, and chivalry was a thing of the past, because everybody laughed at it. We shall some time awaken to the absurdity of our present system of living, to the absurdity of permitting such conditions of public and private hygiene as to make disease possible and then employ a great army of immunizers or other kind of physicians to help us recover from disease which we can prevent by intelligent action; and then our present methods will be changed as rapidly as were the social conditions in the days of Don Quixote. Impure water systems, dirty dairies, questionable meat, and adulterated foods of all kinds have got to go, and with them will go the immunizer and the physician whose only thought is to relieve people who are sick from preventable diseases.

Let us, as physicians, lend every aid to bringing about better sanitary conditions. It may force us into a change of occupation, but there is more dignity and more value in the skilled hygienist than there is in the immunizer.

One thing which we feel like criticising a little is the half-apologetic air of many of the Osteopaths. We hear more than one of our professional brethren justifying his profession by the staunch declaration that it was "just as good as any other system." Now, as a matter of fact, if it is not a great deal better than any other system, Osteopathy has no place in the world.

We would not intentionally stimulate our people into a vain and foolish arrogance, but we would have them understand that their profession lives and will continue to live only because it is a system superior to anything which the world has previously had. While common sense and ordinary professional modesty must unite to prevent our making foolish claims for ourselves and our profession, still let us have the feeling born of proper self-respect and of a knowledge of real conditions that we have so far as we know the best system of treating disease which the wisdom of the ages has thus far evolved.

PART II.

Scientific Investigations

*THE DEVELOPMENT OF THE EPITHELIAL ORGANS.

The following paper is based upon the study of a series of embryonic mice. The greater part of it is simply a confirmation of facts long since enunciated, but some deductions have been drawn which I believe have not previously been published. It is hoped that this study may lay the foundation for work on abnormal growths.

Epithelium, as the term is used in the present paper, may be defined as a cellular tissue, one surface of which rests upon a membrane known as the basement membrane, the other surface being free. It is the first tissue which is clearly differentiated in the embryo. With few exceptions true epithelium membranes are either upon the outer surface of the body or they line cavities which freely communicate with the outside. The most striking exceptions to the last statement are the epithelial tissue of the inner ear, the supra-renal capsules, the pituitary body, and the thyroid gland. The cells forming the free surface of an epithelial membrane frequently have slender hair-like projections which are known as cilia. It appears probable that when they exist they always develop in the fœtus. In their most typical form the cilia are freely movable and quite separate, but in many cases these projections become highly modified and they may become so matted together as to form what is sometimes called the cuticular membrane. This membrane usually appears structureless and may completely cover the epithelial surface. The basement membrane upon which the epithelial cells rest is of doubtful origin. In many cases it appears to very closely resemble the cuticular membrane, and may be of a similar origin. In other cases careful observers have believed that it is derived from connective tissue. The epithelial membrane may consist of a single layer of epithelial cells in which case it is known as "simple epithelium" or it may consist of a varying number of superimposed layers, when it is known as "stratified epithelium." The layer of epithelial cells in stratified epithelium, as well as the cells composing a simple epithelial membrane exhibit what may be called polarity. By this is meant that the structure of the ends of cells nearest the

*Jour. A. O. A., Dec., 1907.

basement membrane is rather simpler than that of the parts of the cells most remote from the basement membrane. This condition might be anticipated as the free end of the cell is most immediately in contact with the external environment and a high degree of organization is necessary to enable it to adapt itself to varying conditions. The end of the cell nearest the basement membrane is frequently spoken of as the vegetative pole of the cell, to distinguish it from the animal pole of the cell which is the farthest from the basement membrane.

REPRODUCTION.

All typical epithelial membranes are free from both blood and lymph vessels, but sensory nerve endings are abundant in almost all epithelium. There is a marked difference between the reproductive methods of embryonic and adult epithelial cells. When an embryonic cell divides it gives rise to two cells neither of which differ in any marked degree from the parent cell. In adult epithelial cells, however, the foregoing statement is the exception rather than the rule, for in these one of the daughter cells resemble the mother cell, while the other differs from the mother cell to a greater or less extent. In stratified epithelium the cells which differ from the mother cells are those which form the superficial layers. Sometimes instead of these aberrant cells becoming cemented together, they remain as free, wandering cells. These are very abundant in the skins of some scaleless fishes. In the mammals they are the cells which are sometimes known as macrophages. It is quite possible that these add measureably to the protection of the epithelial membrane from bacterial invasion.

It is proper to note at this place that with the exception of the cells of the nervous system, the muscle cells and the leucocytes, the epithelial cells are the only active cells found in the animal body. The three first named cells are highly specialized in their functions, while the functions of the epithelial cells are widely generalized.

It seems that there is rather a close relationship between the specialization of epithelial cells and the extent to which the epithelial cells have pushed into or invaded the connective tissue. This statement appears to embody a general, rather than specific truth. The surfaces of plants are composed of cells closely resembling epithelial cells, and the glands of such plants as secrete volatile oils are made up of these invading cells.

GLANDS.

This statement is founded on observations made on the umbelliferae and the liliaceae. All of the true glands of the body are formed from invaginations of epithelial cells. Probably without any exceptions this growth primarily consists of a solid cord of epithelial cells of the embryonic type. At a later time this solid growth becomes tubular from a re-arrangement of the component cells and the deeper epithelial cells, by a process of differentiation, become specially fitted for producing the secretion or excretion proper to the gland. It may be noted that the glands form one of the four kinds of epithelial invasions, The other kinds are known respectively as dilatations, diverticulae and vesicles. By dilatations are meant enlargements of what were once tubes of nearly uniform diameter. The best examples of dilatations are the stomach, uterus, and bladder. It is possible that the lungs should be included in this list. By diverticulae are meant blind outgrowths from cavities already existing. These are exemplified in the bodies of the higher mammals by the coecum, vermiform appendix and possibly by the gall bladder. Both dilatations and diverticulae differ from glands by being formed by the harmonious growth of both epithelial tissue and connective tissue, while glands are purely an epithelial invasion of the connective tissue. Vesicles are formed by an epithelial invasion of connective tissue closely resembling gland formation, but the epithelium eventually becomes completely cut off from the surface by the constricting growth of the connective tissue. The best example which we have of a true vesicle is the epithelium of the inner ear. In early embryonic life this begins as a solid ingrowth of epithelial cells which afterwards becomes a hollow sphere and is eventually completely cut off from the surface by the growth of the surrounding connective tissue. As the central nervous system is developed in very much the same way, it is perhaps philosophical to regard this also as an example of vesicular formation. It would be difficult to over-estimate the importance of embryonic development of these four forms of invagination. The difference between the structure of very simple animal forms and the more complex forms is largely due to the differences in the invaginations. Two forms of typical glands have been recognized by histologists. These are the tubular and racemose. In the first the secreting cells of the glands are arranged around a lumen of uniform or nearly uniform diameter. In the second the terminal portion of the lumen is expanded into a sphere which is surrounded by the active epithelial cells. The earlier histologists regarded the second as the more common form of gland, but further research leaves room for grave doubt of there being one really good example of a racemose gland found in the bodies of the higher mammals. From the standpoint of secretion, glands may be divided into two kinds; the serous and mucous. In the mouse (the embryo of which has been extensively used in the preparation of this paper) there appears to be no essential difference in the development in these two kinds of glands. The secretion of the serous glands is more watery than the secretion of the mucous glands. The serous glands usually elaborate some ferment. The secretion of the mucous glands is mucoid in character, and is devoid of any ferment. Modern histological methods render it comparatively easy to distinguish between these two classes of glands. The cells of serous glands in the resting state are well filled with granules from which the ferment is to be formed, while the cells of mucous glands present a more nearly homogenous appearance. The salivary glands are divided between these groups. The parotid in the human being is almost exclusively a serous gland. The submaxillary is a mixed gland containing both serous and mucous cells, while the sub-lingual is almost invariably mucous in character. All of these glands are fine types of the highly developed and specialized tubular glands.

The poison glands of poisonous reptiles are compound tubular glands, closely resembling the salivary glands in structure. The peculiarity of their secretion is to be explained by their physiological activity rather than by their apparent structure.

Lingual glands which are rather abundant on the posterior portion of the tongue are simple in structure and belong to the mucous type. The glands of the stomach are upon the whole even simpler than most of the glands of the tongue. Like the other glands of the body, the gastric glands begin as solid cords of epithelial cells pushing into the connective tissue. These cords eventually branch and when the cells composing the cord arrange themselves in such a way as to form a lumen, it is the cells of the branches which differentiate into the truly active cells of the glands. Somewhat before birth a differentiation of the gland cells occurs which results in the formation of the special cells which produce pepsin and those which secrete hydrochloric acid. The enteric glands in the mouse appear to develop simultaneously with the villi. The structure of the enteric glands is upon the whole simpler than the structure of the gastric glands, as the enteric glands seldom branch. As a result of careful study of several adult forms I believe that the only cells of the enteric glands which are truly active are those situated deep in the crypts, and these are believed to be the only epithelial cells of the intestine which reproduce themselves.

The sudoriferous glands begin their development like other glands. The most striking peculiarity of their development is that the downward growth of the cord of epithelial cells appears to be checked in the connective tissue, and as the growth continues after the checking occurs, it results in the formation of a coil. The cells of this coil are probably the most active cells of these glands. The sebaceous glands begin their development like the sudoriferous glands, but their downward growth is not checked as is the growth of the sudoriferous glands and they (sebaceous) show more or less of a tendency to branch. The tarsal glands (meibomian) are closely related to the sebaceous glands in structure and in function, the most striking difference being that the tarsal glands show a marked disposition to produce short, thick branches which pass off at right angles from the parent stem.

Ceruminous glands are branched tubular glands often coiled in such a way as to closely resemble the sudoriferous glands. The fact that their secretion is sebaceous in character while their structure is more or less sudoriferous lends possibility to the idea that the sebaceous and sudoriferous glands have differentiated from a more generalized gland and are thus generically related.

The tear glands are compound tubular glands. Neither the structure nor the development of these glands appear to present any striking feature. In an embryonic mouse, three millimeters in length,—the different lobes of the glands appeared to be separated from each other, so it is quite possible that that which constitutes a single gland in the adult may have been developed by the union of several similar subordinate glands.

THE LIVER.

The first indication of the liver is a diverticulum which eventually develops into the gall-bladder. The epithelial lining of this begins at an early time to invade the surrounding connective tissue. Most of these invasions develop into simple or slightly complex mucous glands, but the epithelium on the anterior side of the gall cyst continues its development until such a mass of epithelial cells is formed that the original diverticulum becomes a mere appendage. It is not quite clear as to just how the cells come to arrange themselves so as to utilize their blood supply and at the same time discharge their function as bile producers. In the normal liver, all of the epithelial cells appear to have functional activity and it is probable that no epithelial cells in the body have more diversified functions than these. They not only form two distinct internal secretions, glycogen and urea, but also the very complex secretion and excretion known as bile. They also affect certain toxines in portal blood in a way not yet well understood.

THE PANCREAS AND SUPRARENALS.

The pancreatic gland begins its development almost simultaneously with the liver. In its earlier stages as in its adult condition, it closely resembles the parotid gland. When the cells begin to arrange themselves so as to form the lumen of the gland, this formation proceeds from the end attached to the intestine toward the more distant portions.

There are certain parts of the gland where the cells never arrange themselves so as to form a lumen. These masses of cells are often spoken of as "islands" and they have a function which is entirely distinct from the function of the other parts of the glands. Physiologists have for years recognized these islands as forming an internal secretion which facilitates the oxidation of sugar in the blood. These islands may be regarded from the standpoint of the histologist and embryologist as examples of arrested glandular development.

The suprarenal capsules, the prostate gland, the pituitary body, and the thyroid gland constitute a remarkable series of glands. The suprarenals represent glands whose development has been arrested at a very early stage. In them the epithelial cells have arranged themselves in the form of solid cords but no lumen is developed; consequently there can be no external secretion. Whatever is formed by these cells necessarily passes either into the lymph stream or blood current. The pituitary body represents a stage of development one step in advance of the suprarenals. In this body acini are formed by the rearrangement of the epithelial cells, but the epithelium which connects these with the surface degenerates and in no case do these acini communicate with the surface, hence of necessity we again have a gland whose secretion is entirely internal. The prostate gland represents a stage further in advance as the acini communicate with the surface, but communicate through many openings instead of discharging through a common duct, as is the case with the parotid and pancreatic glands both of which are upon the whole much more highly organized.

In passing it may not be without importance to call attention to the fact that almost the entire length of the male urethra is glandular. The invaginations or ducts are numerous and while the secretions are probably of slight value, the ducts and glands are of vital importance to the pathologist, as they frequently become the seat of infection, especially gonorrheal, and from these places it is extremely difficult to dislodge the gonococcus.

The thyroid gland is a good example of a gland which has passed its highest stage of development and which has in part degenerated. This is shown by the fact that in early embryonic life the thyroid gland has a distinct outlet through the foramen caecum, at the base of the tongue. This outlet is lost as development proceeds and the gland in an adult represents about the same type of development as does the pituitary body.

MAMMARY GLAND.

The mammary gland is represented in the embryo by what is known as the milk ridge. This is an epithelial thickening extending the entire length of the trunk; deep invaginations of cords of epithelial cells are developed at intervals. In some mammals like the pig, cat and dog most of these go on to complete development and may become functional. In some other mammals the anterior embryonic glands are suppressed and only the posterior ones become functional. The cow, sheep and horse, are examples of this. In others the posterior part of the milk ridge never develops and the anterior part alone becomes functional. The primates and elephant are examples of this. In early embryonic life, it is impossible to distinguish between the sexes as far as the development of the mammary gland is concerned. In both cases the embryonic development is marked, but in the male this is eventually suppressed while in the female there is retained at least the possibility of complete development, though it apparently seldom happens that the solid cords of epithelial cells give way to true tubes until about the time that the female bears young. A careful study of the mammary gland shows that so far as structure is concerned, it possesses some of the characteristics of both the sudoriferous glands and the sebaceous glands.

NEUROEPITHELIUM.

Almost all fish have a series of sense organs extending the entire length of their bodies on either side. These organs constitute the "lateral lines," and they are formed by an invagination of the epithelium. In higher vertebrates both the sensory portions of the nose and of the internal ear originate in the same way as do the organs of the lateral line, and it is highly probable that they represent the most highly developed organs of this series. All of the lateral line organs are abundantly supplied with nerves, and it is in these organs that we find the most primitive form of neuroepithelium. By neuroepithelium is meant epithelial cells which have processes which more or less remotely resemble the processes of nerve cells and which form synapes either with nerve cells or their processes. They may be regarded as an intermediate step between epithelial cells and true nerve cells. As has already been stated the central nervous system is of epithelial origin. A careful study of its ultimate constituents shows to what a marvelous exent the embryonic epithelial cells are capable of modification.

The nasal cavity is first represented by two epithelial invaginations. At an early period these epithelial cords become hollow and are at first known as the nasal pits. The epithelial invasion continues until it finally reaches the mouth cavity and the pits finally become tubes which open into the mouth. Soon after the opening into the mouth is established, the hard palate begins its development and as this progresses backwards the openings of the nostrils into the mouth are carried back until they open into the pharynx, a condition permanent in the adult. Soon after the development of the nostrils a differentiation of the cells of the regio olfactoria occurs and as a result of this certain of the epithelial cells develop into neuro-epithelium and these constitute the cells of special sense of the nose. In the portion of the nose nearest the external orifice, there are numerous sebaceous glands which apparently differ in no essential respect from other sebaceous glands of the body, either in their development, or general structure. Along these sebaceous glands numerous short stiff hairs are found. The vomero-nasal organs are developed in the lower external portion of the epithelial covering of the vomer bone. These are sometimes known as Jacobson's organs. They are never of functional importance either in the human being or any of the other mammals. In a mouse these organs are clearly distinguishable shortly after the formation of the nasal pits. Like the nostrils themselves, these organs begin as invaginations of epithelial cells, and it is questionable whether they ever advance much beyond this stage of development in the mammals.

HAIR AND TEETH.

There is considerable similarity between the development of the hair and the teeth. In both cases epithelium and connective tissue enter into their structure. In the case of the hair, the connective tissue does not extend beyond the general surface of the body, while the greater portion of the external tooth is composed of this tissue. The epithelial portions of both begin as a thickening which as a solid cord invades the connective tissue. At an early stage of development the developing hair or tooth closely resembles the early stage of a gland; indeed, so far as the hair is concerned, the sebaceous glands do bud off from this primary epithelial invasion. As the epithelial cord of the hair grows downward, the upward development of connective tissue is taking place, but before the downward growth meets the upward growth, the ingrowing epithelium has become cup-shaped at the end and thus fits over the upward growth of the connective tissue. The combination of these two forms the so-called root of the hair. The shaft of the hair which afterwards grows out is formed from the epithelial portion of the root. The epithelial invasion connected with tooth formation furnishes the basis from which is formed the enamel of these organs. The downward growth in many respects, as before stated, is comparable to the epithelial growth which forms a portion of the hair, and the connective tissue of the tooth which eventually forms the dentine is quite comparable to the connective tissue portion of the hair. The downward growth of the epithelial portion of the tooth becomes distinctly divided into two parts with more or less evident trace of a third part. The portion first developed becomes the enamel of the milk teeth, the second part becomes the enamel of the permanent teeth, and the third feebly developed part may occasionally develop into the enamel of a third set of teeth. No epithelial cells of the body are more profoundly modified than are the epithelial cells which form the hair and the enamel of the teeth, and of these, the epithelial cells forming the enamel undergo the greatest modification.

PHOSPHORESCENCE.

Phosphorescence is a phenomenon characteristic of some members of both the animal and vegetable kingdoms. It is by no means certain that it is produced in all cases in the same way. It appears that among certain of the protozoa phosphorescence results from the production of some substance which undergoes oxidation upon contact with the air, and it is quite possible that it is in this way that the phosphorescence of fish is produced. The phosphorescent organs of the toad-fish consist of epithelial invaginations. The cells do not present any very marked structural characteristics, which leads to the suspicion that it is rather a physiological activity of the cell than a histological characteristic.

However, much more work must be done along this line before any positive assertion can be made.

GERMINAL EPITHELIUM.

The origin of the germinal epithelium of the vertebrates is wrapped in almost complete obscurity. All recorded observations up to the present time appear to indicate that it is of mesoblastic origin and at an early stage of development it differs in no observable respect from other portions of the peritoneum of which it forms a part. The first evidence of differentiation is observed when the squamous cells of that portion of the peritoneum which covers the genital ridge develop into columnar cells. Shortly after these cells assume their columnar form some of them proliferate rapidly and form solid cords of epithelial cells which penetrate the connective tissue of the reproductive glands. Up to this point no differentiation has occurred between the ovary and testis, but from this time on a marked difference is observed in their method of development. The solid cord of epithelial cells which has penetrated the ovary becomes tubular and the lower end enlarges. By the degeneration and absorption of the epithelial cells between this enlargement and the surface the lower portion becomes cut off and proceeds with its development as a graffian follicle. The subsequent history of the follicle is so thoroughly described in good works on histology that it seems useless to repeat it in this place. The solid cords which penetrate the testis also develop into tubes, but unlike the tubes of the ovary, they are permanent and the outer ends of these tubes eventually become continuous with some of the tubes of the degenerating Wolffian body and so through these and the Wolffian duct, which is now known as the vas deferens, the testis has a permanent outlet. Little or no enlargement occurs at the lower ends of the tubules in the testis at the place where the graffian folicle is developed in the ovary, but it is in a corresponding place in the testis that the spermatozoa are produced. In spite of all the careful work which has been done by the closest observers and most competent histologists, the complete histogenesis of these cells is very unsatisfactorily explained. It seems quite probable that they are the direct descendants of the germinal epithelial cells which form the original invagination of the gland.

*A CASE OF SPLENO-MEDULLARY LEUKEMIA.

There is no lack of medical literature relating to leukemia, but as very few cases have been discussed by osteopaths, a little more literature upon the subject seems justifiable.

Leukemia is one of several diseases whose most evident manifestation is an abnormal condition of the blood. This is so characteristic that our best authorities are quite agreed that a critical blood examination is the only method whereby it may be distinguished from several other diseases. Although all of the anemias vary widely from the leukemias in their nature and etiology, still the only positive means of distinguishing between them, especially at an early period, is by a careful study of the blood. Two well-defined types of leukemia are recognized, one being that which forms the heading of the present article and the other the lymphatic type. The latter is characterized by a pathological condition of the lymphatic glands and by an abnormal condition of the blood, the chief characteristic of which is a vastly increased number of lymphocytes. As I have never met with a case of this kind, I have no basis for any discussion of this form of the disease and so I proceed at once with the case in hand.

The physical examination of a patient, who was recently brought to the clinic of the Pacific College of Osteopathy for examination, showed a young man of about twenty years of age, of medium height and light complexion. The spleen was greatly increased in size and extended not only clear across the abdomen but as low as the pubic bone. He was able to walk without any special inconvenience, though he soon became exhausted. His pulse and temperature were both nearly normal.

During the time that he remained in the clinic; i. e., from Jan. 22d to Feb. 14th, the pulse varied from 87 to 106 and the temperature varied from 97.3 to 104. During all of this time his respiration, during a period of inactivity, remained at about 30 in a minute. He was subject to more or less headache, although his suffering was by no means severe nor constant. He complained on a few occasions of feeling dizzy on rising quickly from either a chair or bed.

While under treatment the spleen was appreciably reduced in size. It is probable that some cardiac disturbance from which he occasionally suffered was due to this dimunition in size. Between the time of his entrance to the clinic—Jan. 22d, and the time he left, Feb.14th—

*Jour. A. O. A., July, 1906.

I made six careful examinations of his blood. I give the results of these examinations, as they show, among other things, the importance of repeated examinations in these cases. While each examination is indicative of spleno-medullary leukemia, it will be seen that there is a wide variation in comparatively short periods of time, and had any one of these examinations been the only one made, erroneous conclusions as to real condition of the patient might have been drawn. Both the etiology and nature of leukemia are obscure and the indications are that considerable time will elapse before this obscurity shall all be cleared away. The obscurity is due, in part at any rate, to the extreme difficulty of securing the necessary post-mortem material to enable one to complete the study which he may begin during the life of the patient. This difficulty is accentuated by the fact that there is no known method of inducing the disease in animals and that while some species of animals may be more or less subject to the disease, it is generally not recognized until they are about to die, even if it is at that time.

It is clearly established that both the spleen and the red marrow of the long bones are affected to a marked degree in leukemia and reports seem to indicate that the liver also is almost invariably more or less affected. Some pathologists have regarded the abnormal conditions of these organs as being secondary to the condition which is always present in the blood. Those who hold this view regard this disease as distinctly a blood tumor and they homologize this with other tumors by regarding the leucocytes as true blood cells and the liquid portion of the blood as the matrix of these cells. The enormously increased number of leucocytes and abnormal nucleated cells found in the blood are regarded as the equivalents of the infiltrated cells found in the connective tissue in carcinoma. This hypothesis is a rather attractive one but is subject to two serious objections. The first is that blood does not constitute a tissue as the term is generally used by histologists. The relationship between the blood cells and plasma is totally different from the relationship between cartilage cells and their matrix inasmuch as the matrix cartilage is derived from the activity of the cells, while the plasma of the blood is not formed by the blood cells. The second objection is that in all tumors formed by infiltration there are large numbers of dividing cells to be found during the period of rapid growth, but in leukemia dividing cells in the blood are not always numerous. In the present case of leukemia, I made a particularly careful search for dividing cells, but found very few, not many more than might be found in perfectly normal blood.

I here present the results of the several counts and the dates upon which they were made. Each count was made at least four and a half hours after the last meal.

Jan. 25th, erythrocytes 3,120,000, leucocytes 503,600, poikilocytes 280,000, myelocytes 106,000.

Jan. 27, hemoglobin 30 per cent., leucocytes 487,800, myelocytes 80,000.

Feb. 1st., leucocytes 501,200, myelocytes 104,000.

Feb 6th, hemoglobin 30 per cent., leucocytes 146,400.

Feb. 8th, hemoglobin 35 per cent., erythrocytes 3,256,000, color index 54, leucocytes 546,000, megaloblasts 32,000, normoblasts 20,000, myelocytes 256,000.

Feb. 15th, leucocytes 489,600, megaloblasts 127,200, normoblasts 5,600, myelocytes, 127,200.

The four or five kinds of leucocytes found in normal blood are also found in the blood of persons suffering from leukemia, but in addition of these there are a varying number of abnormal cells found, most of which are more or less nearly related to the leucocytes.

In the preceding report I have classed myelocytes with leucocytes and poikilocytes with erythrocytes. The classification of blood elements which I have used in this article is by no means satisfactory, but neither a convenient nor a logical classification has yet been proposed. The classification used by most haematologists is based in part upon the supposed origin of the cells, those produced in the lymphatic glands —lymphocytes—and those produced in the spleen and bone marrow —polymorphonuclear leucocytes, mononuclear leucocytes, transitional leucocytes; in part upon the character of the nucleus as indicated by the names just used, and in part upon the staining reaction of the several kinds of granules which the cell may contain—neutrophiles, eosinophiles and basophiles. It seems unnecessary to comment on the imperfection of a classification based upon these three-fold characteristics.

In the differential counting I made use of the "Triple Stain" and the eosinate of methylene blue.

The terminology of blood work has grown to such proportions and there are so many synonyms that I venture to define the more important terms which I have used in this article. Leucocyte is a general term used to include all of the white blood corpuscles as well as the myelocytes. The latter are large blood cells derived from the bone marrow and are very seldom in normal blood. They are probably polymorphonuclear neutrophile cells in an early stage of development. The myelocytes vary widely in size but the average diameter is a little more than twice the diameter of an average erythrocyte or red blood corpuscle. The large and small lymphocytes differ chiefly in size. Both are derived from the lymphatic glands, and in each the mucleus is nearly as large as the entire cell. The small lymphocyte is about as large as an erythrocyte, while the large lymphocyte is somewhat less than twice this size. The mononuclear leucocytes closely resemble the large lymphocytes, both in size and in their staining reaction. The polomorphonuclear leucocytes are about the same in size as the mononuclears, but the nucleus is subject to wide variations in form and size. The more common form of the nucleus resemble either the crescent, the horse-shoe, or the capital letters E. S. or Z. The poikilocytes are fragmentary and degenerate erythrocytes, very common in anemia, and by no means uncommon in leukemia. The megaloblasts are never found in the normal adult blood. They are about one-third larger than the myelocytes and the nucleus is large, filling most of the cell. The normoblasts are found in the red bone marrow or normal individuals and may be found in the blood after a severe hemorrhage or in those who are recovering from anemia, leukemia or any disease which has seriously depleted the blood.

The patient who furnished the basis of this article was not able to remain in the clinic long enough to make any prediction of the ultimate effect of osteopathic treatment possible, but during the few weeks he was under treatment, he unquestionably made marked improvement, so far as the size of his spleen and general symptoms were concerned.

It is undoubtedly true that much of our work—yes, even our good work—is done without the physician clearly understanding the precise object for which he is working. It is a matter of the most vital moment to the future of osteopathy that we shall be more accurate in the tests which we apply to the work which we do. It is not enough from a scientific standpoint to simply announce that we "treated" a patient and that the patient recovered. The deeper problems relating to the human body should interest us more than they do and the questions relating to public health should be more generally discussed than has been our practice in the past.

*A HYDATID MOLE.

Some time ago a very rare and interesting neoplasm was placed in my hands for examination. The clinical aspect of the case in brief outline is as follows:

The patient was a woman not far from forty years of age. She was without children, although a miscarriage was reported early in her married life. She was not conscious of having been pregnant after this, though the presence of this mole gave positive indication that she had been. She was of a nervous, billious temperament and was a student of far more than ordinary merit. She had been seriously sick for two months or more before the expulsion of this mole. The expulsion of the mole was sudden and wholly unexpected. It was accompanied by almost unendurable pain and violent hemorrhage. Her life was saved only after a severe struggle. Her convalescence after the expulsion of the mole was rapid and there seems to be no reason at the present time for doubting that the recovery is complete.

The growth unquestionably belongs to that class of neoplasms known as the hydatid mole, or hydatidiform mole. These growths are extremely rare and statistics show that when patients suffer from them, death is a very common result. It is probable that they always originate from an abortive pregnancy, but it is equally certain that a long period of time may elapse between the death and expulsion or absorption of the fetus and the development of the tumor.

The laboratory examination of the mass revealed a neoplasm weighing about two pounds and roughly appearing like a large mass of white grapes varying in size from millet seeds to small walnuts. The grape-like masses, when examined, were found to be cysts developed on the ends of the chorionic villi. The fluid found inside of them was not quite so liquid as is the amniotic fluid and was much less dense than Wharton's jelly. In this particular case a chemical analysis showed the presence of about one-half of one per cent. of albumin and nearly two per cent. of sugar. Phosphates and chlorides were present in strong traces. The entire mass was rather larger than a quart cup.

As a general thing the hydatid mole develops early in pregnancy, seldom before the first month and usually not later than the fourth month. If it develops early the fetus almost invariably dies; if it develops later there is a possibility of the fetus's living to complete its

*Jour. A. O. A., June, 1911.

development. As before stated, it seems certain that pregnancy is absolutely necessary for the formation of one of these strange growths, for in every case so far analyzed it appears that chorionic villi constitute their foundation.

In all of the grape-like cysts which were subjected to a particularly careful examination, delicate connective tissue fibres were found in the vesicles, and in every case where a careful examination was made the vesicles had a well-defined epithelial covering. A number of cases have been recorded where the epithelial cells have destroyed the connective tissue of the uterine wall and have gotten into blood vessels and have thus been carried to other parts of the body where metastatic growths have been developed. The arteries in many of the villi in this case were found to be partially degenerated. In some of the cases reported the growth is so closely united with the uterus that its total expulsion is almost impossible.

Hydatid moles are by no means easy of diagnosis. In a thin subject they may be palpated with some degree of accuracy. Where this cannot be done, positive diagnosis may be impossible. If an unusually rapid enlargement of the uterus occurs in early pregnancy and this enlargement is accompanied by severe hemorrhage there may be reason to suspect a growth of this kind.

These moles are much more common in patients somewhat advanced in years than in young people. Patients who suffer from malignant growths upon some other part of the body are somewhat more likely to develop growths of this kind.

In the early stages of development the embryo becomes surrounded not only by the amnion, but by a membrane developed from the amnion which encloses the amnion itself and which is known as the chorion. The chorion consists of two distinct germinal layers, the outer layer being of epiblastic origin and the inner layer being derived from the somatopleuric layer of the mesoblast. The outside epiblastic layer soon divides into two reasonably well-defined layers, the outer one of which is known as the syncytium and the inner one, composed of large well-defined cells, known as the cells of Langhans. Cells of both of these layers push into the decidua basalis in the form of solid cords. At a later time the mesoblast which is rich in blood vessels, grows into these epithelial cords. When it is remembered that the blood vessels of the mesoblast extend from the embryo it will readily be seen how it is that the embryo becomes connected with the chorionic villi. This connection is precisely the same whether the villi undergo normal development or whether they become cystic. These membranes enclosing the fetus are themselves completely enclosed by the decidua reflexa of the uterus. During the later stages of pregnancy the decidua reflexa is normally absorbed but the decidua basalis against which the fetus and its membranes are resting, develops into the maternal part of the placenta. These villi are at first formed over the entire surface of the chorion and this appears to be the permanent condition in the horse and other closely-related animals, but in the human being these villi are of comparatively short duration except in one dish-shaped area which ultimately develops into the placenta. Ordinarily these villi persist during the entire period of pregnancy and it is from the blood vessels of these villi that the fetus gets its nourishment. If for any reason the fetus perishes these villi, as a general thing, quickly lose their vitality and are either expelled or become absorbed, but it occasionally happens that the death of the fetus is not attended by the death of the chorionic villi which may, when no longer controlled by the fetus, rush on into lawless and irregular development.

This development may assume any one of the several forms of which I now speak. The epithelial calls may rapidly multiply without attaining full development. When this occurs we have a primary uterine cancer. It is quite possible that many uterine cancers originate in this way. It may happen that the villi undergo cystic degeneration in which case we have such a growth as I have attempted to describe here. There is always a possibility of the epithelial cells on the outside of the cyst springing into unwonted activity. If the mole is not completely removed and these external epithelial cells proceed to rapid multiplication a cancer may follow a well-recognized cyst. Indeed, it is by no means rare for a hydatid mole to be followed by a cancer.

Another danger, against which the physician must be on his guard, is that of infection following the expulsion of the mole. The safety of the patient demands not only that the mole be removed in its entirety, but that every precaution be taken to prevent the entrance of bacteria into the uterus when the uterus is in such a poor condition to resist infection.

*SOME COMMON ABNORMALITIES OF THE UTERUS.

The normal structure of the uterus is different from that of any other organ in the human body. The outer or serous coat and the thick muscular wall may be passed over with little comment. The simple epithelial lining is not strikingly at variance with other epithelium. But between the muscular wall and the mucous lining is a most interesting layer of tissue which is sometimes known as the uterine stroma.

The stroma is composed of much branched cells forming a tissue of a comparatively loose nature. Among these cells composing the stroma are a varying number of cells closely resembling leucocytes. It is an open question with histologists and embryologists as to whether the cells of the stroma are more nearly related to epithelial cells or to connective tissue cells. From a practical standpoint, the question is not one of especial importance.

One of the comparatively common abnormalities of the uterus is the excessive development of the connective tissue cells which support the cells forming the muscular wall. If this excessive development of connective tissue is immediately underneath the peritoneal covering of the uterus, it is spoken of as a subperitoneal fibroma. If the excessive development is in the wall of the uterus, it is spoken of as a mural fibroma. If the development is immediately underneath the stroma, its growth carries it into the cavity of the uterus and we have a sub-epithelial fibroma. Fibromas of the latter type are frequently extremely vascular and when this is the case and when the fibroma in its inward growth becomes more or less pedunculated, we then have a uterine polyp from which there may be a varying amount of hemorrhage. The extent to which the patient may suffer from hemorrhage is subject to great variation. It may amount to very little or it may be so excessive as to seriously threaten the life of the patient.

Almost all that has been said in regard to the possibility of excessive growth of connective tissue cells forming fibromas may also be said of the non-striated muscle cells. When this is the case, the tumor is known as a myoma. In most of the cases which have come under my observations, the growth consists of a mixture of connective tissue cells and muscular cells constituting what is known as a fibromyoma. These growths in and of themselves are never malignant,

*Read before Section in Gynecology and Obstetrics at Chicago meeting of the Am. Ost. Ass'n., July, 1911. Pub. A.O.A. Jour., Feb., 1912.

although, as has been pointed out, they may be, from their tendency to produce hemorrhage, more or less dangerous to the health and even to the life of the patient.

It is not rare to find a patient suffering from an excessive epithelial growth in the uterus. Under normal conditions, the entire inner surface of the uterus is more or less glandular. Sometimes the cells in these glands begin an unusual lawless growth and the glands become enormously enlarged and extended. As long as this growth produces parts which may be functional, we simply have a hypertrophied gland, but when the glandular epithelial cells are carried far into the substance of the uterus and when they cease to have such an arrangement as makes it possible for them to function as gland cells, we then have an adenoma.

Adenomas of small size are by no means unusual. Like the myoma and fibroma, the adenoma is a benign growth, but like all other abnormal growths, it is more or less of a menace to the health and even to the life of the patient. As the adenoma is developed from non-vascular tissue, there is little danger of its resulting in hemorrhage, but it is by no means unusual for the epithelial cells forming the adenoma to give rise to epithelial cells which are still more lawless and which break through the basement membrane which normally restrains all epithelial cells and thus begin an invasion of the connective and muscular tissue of the uterus. When this is the case, we have the beginning of a carcinoma.

This malignant growth once started may develop either slowly or rapidly. It certainly appears in many cases that the development is slow and while it may occasion more or less suffering, it may not materially shorten the life of the patient. On the other hand, the development may be so rapid in character as to present a most serious problem, both to the physician and the surgeon.

It would not be proper to close a paper of this character without calling attention to the increasing importance which the endothelial cells of capillary blood vessels are assuming in the minds of the best pathologists. It is barely possible that many abnormal growths which have been attributed either to epithelial, muscular or connective tissue cells may have arisen from the endothelial cells of capillary blood vessels. Should further investigation prove this to be the case, it would be a reason for our attaching even more significance to circulation than we do at the present time.

*SOME EXPERIMENTS WITH THE OPSONIC INDEX.

During the years 1909 and 1910, I made a series of careful experiments to determine whether or not it was possible to affect the opsonic index of an individual by mechanical manipulation. This series of experiments was made upon myself, the report forwarded to the Research Institute and published in its first bulletin.

During the years 1910 and 1911 I made another series of experiments. Some of these were made upon a person known to be the victim of chronic tuberculosis; others were made upon persons supposed to be entirely free from tubercular taint. As this report may possibly be made the basis for other work, I present my results in tabulated form and give a brief description of my methods, so that every one may be in a position to judge of the value of the work.

In every case I used the leucocytes from my own blood. I obtained blood serum from the person who was to be experimented upon and determined the opsonizing power of this serum. The person was then placed upon a table and the splanchnic area of the back was highly stimulated. The subject was then placed on his back and direct and heavy stimulation was applied over the region of the liver. The whole process of stimulation occupied perhaps twenty minutes of time.

From half an hour to two hours after this stimulation, blood was again drawn from the patient and its serum separated from it. The test was of course made by comparing the opsonizing power of the serum obtained before the stimulation with the serum obtained after the stimulation.

The first person experimented on was Miss L., who is a victim of chronic tuberculosis. The experiments were made by taking her serum and then subjecting her to stimulation as already described and after the stimulation again taking blood from which the serum was obtained.

The chief value, as I understand it, which centers around this work, lies in the fact that phagocytosis appears to be greatly increased by mechanical manipulation. It shows that in the cases reported upon the susceptibility of the individual to tubercular infection was greatly decreased by mechanical stimulation. If further experimentation shall

*Read before Research Institute Session, Chicago meeting of the Am. Ost. Ass'n., 1911. Pub. Jour. A. O. A., July, 1912.

show that this specific fact is a general truth, if it should be found that phagocytosis toward all bacteria is increased by mechanical stimulation, then we certainly have in mechanical stimulation a prophylactic measure which is much more valuable than prophylactic antitoxins have ever been supposed to be, even by those who had most faith in them. The tabulated results were as follows:

DATE	From the influence of serum taken before stimulation		From the influence of serum taken after stimulation		Opsonic Index after stimulation compared with Index before stimulation	Percentage of gain by stimulation
	Leucocytes counted	Bacteria ingested	Leucocytes counted	Bacteria ingested		
			MISS L.			
March 17	50	151	50	163	107.9	7.9
March 24	80	334	80	407	121.8	21.8
April 7	85	257	85	283	110.1	10.1
April 14	75	312	75	354	113.4	13.4
April 21	50	116	50	132	113.7	13.7
Average						13.4
			MR. W.			
April 28	50	211	50	253	119.9	14.7
May 5	80	402	80	463	115.1	15.1
May 12	100	287	100	315	109.8	9.8
May 19	80	227	80	242	106.6	6.6
Average						11.5

I suspect more strongly each year that our ultimate conclusion will be that it is not good practice to ever introduce into the human body any substance which is not a normal constituent of the body and that whatever we do, either in the way of prophylaxis or in the way of treating disease, should be done in the way of aiding and stimulating nature, rather than in supplementing her efforts by outside and unnatural forces.

All of the work which has been done during the last few years which throws more light upon the human body, impresses us with the supreme importance of the normal structure of the body. To the educated biologist, normal function without normal structure is simply inconceivable. Not only must the structure of organs be normal, but organs must be in normal relationship to each other.

One cannot contemplate the results recorded here without the question arising as to how they have been produced. Several possible answers readily present themselves. It may be due to simply increasing blood pressure; it may be due to having increased the elimination from the body; it may be due to having caused more rapid oxidation.

Another question which I have not solved, but which is of great practical importance, is in regard to the length of time this increased opsonic index lasts. It will readily be seen that if prophylactic use is to be made of physical manipulation, the physician should have some clear idea as to how frequently his treatment should be administered.

We are as yet wholly ignorant of the origin of the opsonins. It is not improbable that when we shall definitely know where they originate, we may by direct stimulation of the organ or organs producing them be able to increase them much more rapidly and more certainly than we now can, while we are working entirely in the dark.

In a report of this kind, there is little room for speculation, but I may, perhaps, be pardoned for suggesting, not the possibility but the strong probability, that the opsonic index is materially lowered both by bony lesions and by muscular contractions.

Records of forty-four cases treated in the clinic of the Pacific College of Osteopathy have been studied in this connection. Of these, the anterior interscapular spine was associated with the posterior lower dorsal and upper lumbar in thirty-seven cases. In one case the upper dorsal spine was decidedly posterior and the lumbar curve was exaggerated. In one other case the curves were fairly normal and the spinal lesions consisted chiefly of a lack of mobility throughout. Both of these cases were of fibroid phthisis, and the disease has been present for many years. These cases include pulmonary, laryngeal, hip and knee, omentum and kidney tuberculosis, tubercular lymphatics and arthritis. Pott's disease was not included.

The spinal outline characteristic of tuberculosis and of the pretubercular stages presents the following peculiarities: The cervical spine presents various abnormalities, usually lesions involving single vertebrae and associated with irregular muscular tensions. The upper thoracic spine is anterior, the ribs drooping and rather more freely movable than normal; the vertebral articulations are less movable than normal; the tissues in the neighborhood of the upper two or three dorsal spines are abnormally sensitive and the muscles innervated from these segments are contracted irregularly when the disease involves the apices. The lower interscapular region is found sensitive and these muscles are contracted when the lower lobes of the lung are involved, and the location of these sensitive areas may be employed in the localization of the lung area infected.

In every case recorded in this clinic, lesions involving the area of the origin of the upper and middle splanchnic nerves have been found. The typical tuberculosis spine must include lesions of the lower dorsal area. Probably these lesions are predisposing factors in tuberculosis, partly because of the effects produced upon nutrition thereby, but doubtless the lack of the normal mobility of this part of the spine prevents the normal stimulation of the liver, thus the normal opsonic index is lost, and immunity broken. The treatment of tubercular cases should include careful attention to the splanchnic area, the maintenance of the normal mobility and structural relationship of the entire spinal column, and such stimulating movements to the ninth and tenth thoracic neighborhood as is indicated in each individual case.

Osteopathic physicians and investigators are the only scientists now working on bony lesions and muscular contractions as related to the etiology of disease. There is no lack of competent investigators who are working on the body serums and on the problems of bacteriology in general. Just now it seems to be our special business to investigate the effect of bony lesions and muscular contractions upon the body, not only in the somewhat superficial way in which it has been done in the past, but to study the effect of these conditions upon the metabolism and the blood-and-lymph-forming organs of the body.

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*OBSERVATIONS ON A FETAL CALF.

On the second day of June of the present year I was making a close examination of a fetal calf of perhaps six months' advancement. The Amnion was intact and the calf still floated in the Amniotic fluid. I distinctly saw it swallow three times in succession, and on opening its stomach I found at least twenty c.c. of Amniotic liquor present. In this epithelial cells and hairs were plentiful. I have found scales, hairs, etc., in the stomach of fetal calves, lambs and cats, and it is possible that the fetus derives an appreciable amount of nourishment from the fluid thus swallowed.

The subject is worthy of careful and extended investigation.

*The Osteopath, P. S. Q., July, 1900.

*INVESTIGATIONS OF THE PHAGOCYTIC INDEX.

During the winter of 1911-12, I began a series of investigations for the purpose of determining how long the opsonic index is affected by mechanical manipulation. It will be remembered that as early as 1884, Mechnikoff discovered the fact that the white blood corpuscles possess the power of destroying many bacteria as they enter the tissues of the body. For a number of years it was supposed that this was the only defensive measure which the body employed against the invasion of parasites; but at a later time, it was found that when parasitic invaders enter the body, a response is made to them, not only by the phagocytes which devour them, but that specific substances were produced in the blood, which dissolved them. These substances were called lysins; and soon after this discovery, it was shown that another class of bodies was produced, which are known as agglutinins, the function of this latter substance being to cause bacteria to adhere to each other until they form large masses or clumps. The next discovery was one of great practical importance, and was that phagocytosis is largely dependent upon bacteria being acted upon by substances produced in the blood, which are called opsonins. Careful experiments showed that unless the bacteria were acted upon by opsonins, they were not very readily destroyed by the phagocytes. It was also shown that the opsonins in the blood may be produced as a result of stimulation by bacterial toxins, contained within the bodies of the bacteria, and from this discovery arose the important practice of vaccine therapy.

Somewhat more than two years ago, I discovered, as a result of considerable experimentation, that mechanical stimulation of the liver and spleen, would also increase the opsonins in the blood; at least, so far as the opsonins acting upon the bacilli of tuberculosis are concerned. A few experiments and some clinical experience seemed to indicate that this was also true of other bacteria. If it is indeed true that the opsonins are increased by liver and spleen stimulation, it is a most important fact; for it is highly improbable that the vaccine methods can be used without inflicting more or less injury upon the organism. I believe it is a biological truth that *no substance should ever be introduced into a living organism, which cannot, by digestion and assimilation, become a constituent part of that organism.*

The last experiments which I made and the results of which I

*Jour. A. O. A., Sept., 1912.

append to this article, were made for the purpose of determining how long the increase of opsonins lasted after stimulation. As these experiments were made during the session of The Pacific College of Osteopathy, it was impossible to work with any considerable number of people, as the same individual must be accessible for a number of hours in succession. These experiments were conducted upon one man and one woman, both being, so far as known, in perfect health. The technic of the work was as follows:

TECHNIC.

Before any stimulation, the power of the leukocytes to destroy the bacilli of tuberculosis was determined. All of these experiments were based upon a count of 100 leukocytes and the average number of bacilli which these leukocytes were able to ingest, was called the phagocytic index. Immediately after this determination was made, the subject was subjected to mechanical stimulation of the liver and spleen region. At varying intervals of time after this, the phagocytic index was determined, with the results shown in these tables.

It is needless to say that a certain allowance must be made in work of this kind for error, and as both of the people experimented upon were particularly busy people, the results may have been somewhat vitiated by their mental and physical activity. It will be observed that the effects of stimulation disappeared in between four and six hours. If further experimentation shall show that this is universally the case, we have here a key to the length of time which should elapse between osteopathic treatments in cases of acute diseases. It is with no inconsiderable hesitation that I present these fragmentary and incomplete results; and it is with full knowledge that further investigation may show serious fallacies, that I send this matter to the printer; but our profession is young, and our research work is in its extreme infancy, and perhaps the publication of results, which will need careful revision, will do good rather than harm.

Mr. Y, April 8th, 1912.

Phagocytic Index before stimulation	3.42
One-half hour after stimulation	4.21
Two hours after stimulation	4.44
Three hours after stimulation	3.83
Four hours after stimulation	3.12

Miss X, April 8th, 1912.

Phagocytic Index before stimulation	4.23
One-half hour after stimulation	6.42
Two hours after stimulation	5.17
Three hours after stimulation	4.76
Four hours after stimulation	4.34
Five hours after stimulation	3.92

Mr. Y, April 9th, 1912.

Phagocytic Index before stimulation	3.80
One-half hour after stimulation	3.00
Two and one-half hours after stimulation	3.10
Four hours after stimulation	3.40
Five hours after stimulation	3.40

Miss X, April 9th, 1912.

Phagocytic Index before stimulation	5.00
One-half hour after stimulation	7.30
Two and one-half hours after stimulation	7.10
Three and one-half hours after stimulation	6.50

Mr. Y, April 10th, 1912.

Phagocytic Index before stimulation	3.50
Forty-five minutes after stimulation	5.35
Two hours after stimulation	5.42
Three hours after stimulation	3.72

Miss X, April 10th, 1912.

Phagocytic Index before stimulation	4.51
One-half hour after stimulation	5.26
Two and one-half hours after stimulation	4.64
Three and one-half hours after stimulation	3.26

Mr. Y, April 11th, 1912.

Phagocytic Index before stimulation	4.01
One hour after stimulation	6.02
Three hours after stimulation	5.23

Mr. Y, April 12th, 1912.

Phagocytic Index before stimulation	4.61
One-half hour after stimulation	6.71
Two hours after stimulation	5.48
Three hours after stimulation	3.72
Four hours after stimulation	3.91
Five hours after stimulation	4.67

Miss X, April 13th, 1912.

Phagocytic Index before stimulation	4.89
One hour after stimulation	5.78
Two hours after stimulation	6.04
Three hours after stimulation	5.52
Four hours after stimulation	5.64
Five hours after stimulation	5.01

Mr. Y, April 16th, 1912.

Phagocytic Index before stimulation	4.56
One-half hour after stimulation	6.87
Two and one-half hours after stimulation	4.37
Four hours after stimulation	5.36
Six hours after stimulation	3.27

Miss X, April 20th, 1912.

Phagocytic Index before stimulation	3.85
One-half hour after stimulation	5.54
Two and one-half hours after stimulation	4.89
Four hours after stimulation	4.02
Five hours after stimulation	4.07
Six hours after stimulation	3.59

*EXPERIMENTS WITH DRUGS.

During the past year I have made a number of experiments in regard to the effect of drugs commonly used as medicines upon the protozoa. In many respects these organisms closely resemble the epithelial cells of our bodies. In all cases drugs proved fatal to the protozoa, even when the first effect seemed to be that of stimulation. These experiments have not yet gone far enough to warrant any general or far-reaching conclusions, but it is safe to suspect that their effect upon the epithelial cells is quite as injurious as is their effect upon the unicellular animals, and that whatever good may come from their stimulating effects upon some cells is more than counterbalanced by their disastrous influence upon the epithelium of the organs of elimination. If this shall prove to be true, there is certainly another good reason why the physician should avoid their use.

*Report given at A. O. A. meeting at Kirksville, 1918. Pub. A. O. A. Jour., Aug., 1918.

*THE PURIN BODIES.

WHAT ARE THE PURIN BODIES?

The purin bodies are a group of closely related compounds of which uric acid may be taken as a type. The name purin is derived from the Latin word purum (pure) and probably refers to the fact that purin itself is the mother substance from which all of the so-called purin bodies may be derived. Its chemical formula is $C5\ H4\ N4$ and to this as a nucleus various additions of atoms and radicals may be made, resulting in a large number of compounds having a general chemical and physiological resemblance to each other.

The most important purin bodies, so far as the physiologist is concerned, are hypoxanthin ($C5\ H4\ N4\ O.$), xanthin ($C5\ H4\ N4\ O2.$), uric acid ($C5\ H4\ N4\ O3.$), theobromin ($C5\ H2\ C2\ H6\ N4\ O2.$), caffeine ($C5\ H4\ N4\ O2\ C3\ H6.$), guanin ($C5\ H5\ N5\ O.$), adenin ($C5\ H4\ N4\ NH.$), paraxanthin ($C5\ H2\ C2\ H6\ N4\ O2$).

There are hundreds of these related compounds, but the foregoing list includes those whose effects upon the human body are best known.

Hypoxanthin and xanthin are generally found together. They occur in urine in small quantities, but they are much more abundant in meat extracts. When prepared in a pure state they are in the form of a white or slightly grey powder, which is alkaline in reaction and which is almost insoluble in water, alcohol and ether. They form soluble crystallizable salts with most acids. Uric acid is to a very limited extent a normal constituent of mammalian urine. It is the chief nitrogenous constituent of the semi-solid urine of reptiles and birds. In a pure state uric acid is a white, crystalline, odorless, tasteless substance and like xanthin and hypoxanthin is almost insoluble in water, alcohol or ether. It requires 15,000 parts of cold water and 1,900 parts of boiling water to dissolve it. It is needless to say that it is sharply acid in reaction.

Theobromin is not normally found in animal tissues, but is abundant in the seeds of the theobroma cacao tree, from the seeds of which chocolate is made. It is because of its presence in this popular beverage that it is of interest in this place. Theobromin is a white, crystalline solid, slightly soluble in water, ether and alcohol and it volatilizes at a temperature of 290 degrees C without decomposition. Its reaction is neutral, but it forms salts with a number of acids.

*Jour. A. O. A., Aug., 1905.

Caffeine appears to be identical in composition with theine. Like theobromin, it is not found in animal tissue. It is found in the leaves of the tea plant and in coffee berries. In a pure state, it crystallizes in long, silky needles, soluble in 80 parts of cold water and 33 parts of alcohol. It is slightly soluble in ether. Its reaction is neutral.

Guanin is a white amorphous powder, almost wholly insoluble in water, alcohol or ether. It is abundant in Peruvian guano and is found in small quantities in the pancreas, liver and muscles of animals.

Adenin is usually found in the form of flat crystals, with a lustre which reminds one of pearl. It is found in the liver and also in the urine. It is basic in reaction and forms salts with mineral acids. Both guanin and adenin play an important part in the activity of cells.

Paraxanthin is an isomer of theobromin, which it closely resembles in its chemical, physical and physiological properties. It is to a very slight extent a normal constituent of urine.

WHAT IS THE PHYSIOLOGICAL EFFECT OF THE PURIN BODIES UPON THE HUMAN SYSTEM?

The foregoing question is not an easy one to answer. It is probably true there is a wide range among individuals in regard to the way in which they are affected by the purin compounds. It appears that some people are affected very little, probably not to any appreciable extent, while others suffer very severely from their inability to excrete the purins which are ingested with their food. Physiologists recognize two sources of purin in the animal body. One source is the ordinary metabolic processes of life. Some of the purin bodies, uric acid, xanthin and probably some others, are formed whenever a cell is destroyed by any vital function. This is especially true of the cells of the pancreas, the liver, the thymus and other true glands. Purin which results from the natural metabolism of the body is called endogenous purin. Experience shows that the endogenous purins are nearly constant in quantity while the exogenous purins are subject to wide variations. It will be readily noted that while it may be possible for us to free ourselves from exogenous purins, we can never free ourselves from endogenous purins.

This is only another of the very numerous instances of the inherent imperfection of the animal body. From the very nature of things, no organism can ever develop to a higher state of perfection than that which enables it to do its work "well enough."

Dr. Alexander Haig traces a number of diseases to the presence in the body of exogenous purins. Among the diseases thus explained by him are epilepsy, asthma, gout, Raynaud's disease, rheumatism, Bright's disease and a considerable number of others. While it may not be safe to accept all of Dr. Haig's views without further investigation, it certainly is not safe to reject them until investigation has demonstrated their fallacy. Dr. Haig believes that owing to its slight solubility uric acid may accumulate in the blood, and that it may assume a colloid form which mechanically obstructs the capillaries, thereby raising the blood pressure. This form of high blood pressure is indicated when the color returns very slowly to the surface of the body after an area has been subjected to pressure.

The name Collemia has been provisionally used to indicate a marked excess of colloidal uric acid and urates in the blood. It has been known for several years that a copious colloid precipitate will be formed whenever a warm saturated solution of urates and sodium phosphate is cooled, or when it is rendered acid. This precipitate consists of a combination of acid-sodium-urate and uric acid. It is quite possible that such a precipitation may take place in the body when the blood is charged with uric acid or urates, and its alkalinity is temporarily diminished or neutralized by the ingestion of acids. In such cases the capillaries of the liver, spleen and other organs of the body will at once become clogged with the colloid urates, and an attack of gout or some closely allied disease will result. Under these conditions the blood is abnormally free from uric acid and urates. Careful experiments show that a filter saturated with urates will retain urates from an acid solution, which is far from being saturated. If a filter is partially saturated with common salt, for example, and a partially saturated solution of salt is then passed through the filter, the filtrate will contain a higher percentage of salt than the original fluid, but if the same experiment is tried after substituting a soluble urate for the salt and slightly acidifying the solution, the filtrate will contain a lower percentage of the urate than the original solution.

I made a number of experiments which seem to warrant the foregoing statement. The determination of the urates was made with Ruhemann's uricometer, and the results are probably accurate within a narrow limit. In my experiments I used three thicknesses of gray German filter paper. I shall present the results of only three cases: (a) Urine clear, sp. gr. 1022, slightly acid; uric acid .078 per cent. After passing through a thin white filter paper .076 per cent. After passing through three filter papers, which were already heavily charged with urates, .051 per cent. After strongly acidifying with acetic acid, the same sample showed only .026 per cent. after similar filtration. (b) Urine clear, sp. gr. 1019, slightly acid; uric acid .064 per cent. After passing through thin filter .061 per cent. After passing through three papers, similar to those used in (a), .042 per cent. After acidifying with citric acid .021 per cent; acidifying with acetic acid .022 per cent. (c) Urine slightly cloudy with phosphates. Alkaline, sp. gr. 1017. Uric acid .059 per cent. After filtering through thin paper, uric acid .058 per cent. After passing through three papers as in (a) and (b), .54 per cent. After acidifying with acetic acid .023 per cent. It will be noted that the diminution of the urates is almost wholly dependent upon their acidity, or what seems to be the same thing, upon their being in a colloid state.

If it is true, as many able physicians suspect, that migraine is due to high blood pressure, resulting from collemia, the relief which is so frequently experienced from the inhalation of ammonia would be easily explained on the ground that by increasing the alkalinity of the blood, it made possible the rapid solution of the colloid urates which were clogging the capillaries. It would also explain the headache and the rheumatism and gout which follows the use of wines and beers, both of these being more or less acid. It has been suggested that fatigue which is not the result of hunger, may be due to the imperfect nourishment of the tissues owing to the imperfect circulation due to collemia.

SOURCES OF THE PURIN BODIES.

At the risk of some repetition, I now propose briefly considering the sources of the purins found in the body. As before stated, some are formed in the body as the result of normal metabolism, and are known as endogenous purins, while others form a part of the food and are known as exogenous purins. The endogenous purins are practically constant for the same individual over long periods of time, while the exogenous purins are of course subject to constant variation with changing diet. It is quite possible that the slight daily variation in the endogenous purins may be found to have a periodic rhythm, though I believe no investigation up to the present time has established this. There seems to be no constant ratio between the excretion of the endogenous purins and urea, though in two individuals, I found it to run quite constantly between, purin bodies 1 and urea 2, and purin bodies 1 and urea 15, but as neither of these persons was well, I do not attach much importance to the results.

It is probable that every tissue of the body yields endogenous purins as the result of its metabolism, and if this be true, then those tissues which are most active would naturally yield the greatest amount. Of the several parts of the cell, the nucleins are by far the most rich in purins and within narrow limits the amount of endogenous purin found is the measure of nucleins destroyed.

So far as exogenous purins are concerned, they must be derived wholly from proteid foods, as it is obvious that none can come from either the carbo-hydrates or the hydro-carbons. The proteids may be divided into two groups, those which are practically free from the purin nucleus and those in which the nucleus is found. All meats are rich in purins, and this is especially true of the glands, like sweetbread (pancreas and thymus), liver, kidney, etc. Peas, peanuts, beans and oats, among vegetables, are especially rich in the purin bodies, containing considerable quantities of xanthin. This is true to a lesser degree of asparagus, onions and mushrooms. Careful analysis indicates that eggs, cheese, butter and all of the milk products, as well as fruit and nuts, are relatively free from the purin nucleus. The same is true of the various preparations of corn and wheat. Tea, coffee and chocolate contain purin abundantly.

THE PRACTICAL APPLICATION.

The reader who has had patience to follow me up to this point will naturally ask: What practical application can I make of a knowledge of the purin bodies? The reply is that we can use all knowledge as soon as we know how to use it, but of course we must have knowledge before we can reasonably expect to make much use of it, and so far as the purin bodies are concerned, we have not by any means passed the stage of investigation. Indeed, many investigations, demanding time and patience and skill, are yet to be made. It certainly seems that even with our present limited knowledge, no thorough investigation can be made of a patient's metabolism without a careful study of his total nitrogen excretion, and this of course includes both his urea and his purin output. A study of this kind demands time and skill on the part of the physician, and his work is made more valuable if he knows the normal endogenous purin excretion of his patient. If the normal endogenous purin output of the patient is known and his diet is accurately known, it is an easy matter to ascertain whether or not any accumulation of purins is taking place in his body. This of course demands an exact knowledge of the percentage of purins in the food used by the patient and the amount of food consumed, but fortunately, so many analyses of the principal food stuffs have been made that it is easy to obtain reliable data.

The determination of the purin excretion for any single day, or even for several days in succession, appears to be of little diagnostic importance. The real value of a careful estimation and study of the excreted purins will only come when it shall be recognized that it is as necessary and important to study an animated machine as it is to study an inanimate machine.

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*HEMORRHAGE INTO THE FETAL SPINAL CORD.

A fetus apparently of between five and six months' development was sent to the Pacific College for study.

The nervous system was removed and fixed in 8 per cent. formalin. The spinal cord, medulla, pons and midbrain were imbedded in paraffine and sectioned. The spinal cord was cut in coronary section, the other parts were cross sectioned. All were stained in iron hematoxylin or acid hematoxylin (Erlich).

In the cord were found many areas or hemorrhage per diapedesis. These were large enough to be distinguished with the unaided eye, in section. The blood had evidently escaped from the vessels very slowly. The neighboring nervous matter had been scarcely disarranged. The hemorrhagic areas included both the gray and the white matter. No hemorrhages were found in the medulla, pons or midbrain.

According to the statement of the mother, the death of the fetus was due to the use of electricity in the hands of a professional abortionist.

A fetus of about the same age, the cause of whose death is unknown, shows no evidence of hemorrhages in any part of the nervous system. An embryo of about ten weeks, injured by traumatism, shows no hemorrhages.

This report is made because it suggests a possible explanation of certain paralyses and mental deficiencies found sometimes in children whose intrauterine life had been subjected to risks of attempted abortion. A further study of embryonic and fetal material is needed, as well as more careful study of the histories of defective children.

*Jour. A. O. A., May, 1911.

*A DERMOID CYST.

A Dermoid cyst, which was removed from a female patient 47 years of age, in a hospital in this city, was recently brought to me for examination. Its weight was 142 grams, or about 5 ounces, and its greatest length was 31½ c.m. (seven inches), its breadth being 7½ c.m. (three inches). The tumor was located in the pelvis and involved both the fallopian tube and the ovary, on the right side. The latter was enlarged to twenty times its normal size. This enlargement was partially due to cysts, enclosing a serous fluid, and in part to the formation of new tissue. The new tissue was connective tissue composed of embryonal cells intermingled with numerous cells of striated muscular tissue. The tumor consisted of two well defined parts.

The smaller part, which was about 11 c.m. (4½ inches) long, 3½ c.m. (1½ inches) wide, and 1½ c.m. (¾ of an inch) thick, was composed of epithelium and connective tissue cells enclosing fatty globules, and detritus resembling disintegrating bone. This mass was made coherent by a quantity of long, light colored hair which permeated every part of it. Some of the hairs were more than two and a half feet in length. They appeared to rise in most cases from hair follicles, which presented no essential variation in structure from the normal type. Among these a few well developed sebaceous glands were found.

The larger part of the tumor was nearly globular in form, about 6 c.m. (2½ inches) in diameter and consisted of bone and cartilage as well as fibrous connective tissue, and epithelial tissue, enclosing fatty detritus. In this portion well developed teeth were found in the epithelial and osseous tissues. Both incisors and premolars were represented in the dentition, and as is very unusual in Dermoid tumors, at least one of the incisors belonged to the milk dentition. This was indicated not only by the size and shape of the tooth, but also by the fact that the root had been almost wholly absorbed. Giant cells were found in abundance around the root of this tooth. All of the teeth were held in place by alveolar processes more or less perfectly developed. Aside from the tissues named, all of which belonged to the outer and middle germinal layer, there was one piece which somewhat resembled a portion of an intestine in gross structure, though the minute structure did not bear out this interpretation.

*Bulletin So. Cal. Acad. Sci., Feb., 1905.

The origin of dermoid tumors has not yet been satisfactorily explained. So far as this particular one is concerned, it is quite possible that it was a twin of the patient which for some reason suffered an early arrest of development, and which subsequently became enclosed in the body of the patient (or twin sister). Here it remained in a quiescent condition for years until it was stimulated into a sudden growth by some change which affected the metabolism of the patient.

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*A FEW WORDS ON TUMORS.

The pathologist frequently receives vomitus, pus and various kinds of scrapings, for examination, to determine the presence or absence of "cancer cells." The laity practically unite in believing that cancer cells materially differ from all normal cells, and this belief is held by many physicians who have not had careful training along the line of structural pathology.

There are two laws relating to abnormal growths which are the keys to all correct thinking and reasoning. The first is that all cells of whatever nature found in the body have been derived from preexisting cells, and the second is that the tissue which forms a tumor of any kind resembles in its general structure tissue which is normal to either the adult or embryonic body. These two statements being true, it will readily be seen that it is by no means easy to exactly define a tumor, as almost any part of the body is subject to more or less hypertrophy or overgrowth. For practical purposes a hypertrophied condition means not only an increase of the part in size, but also in function, while the term tumor means an increase in size with no corresponding increase in function. A forcible illustration of these two conditions may be drawn from a normal and an abnormal accumulation of fat. Even a normal accumulation of fat may be very much localized, as when, for instance, it is chiefly confined to the omentum, but however localized a normal accumulation of fat may be, it is readily utilized when demanded by the necessities of the body, but a lipoma or fatty tumor remains practically unaffected by the needs of the body, even if these needs press to the point of starvation.

A hypertrophied gland is capable of more functional activity than

*Bulletin So. Cal. Acad. Sci., June, 1906.

a strictly normal gland, as, for example, the highly hypertrophied mammary gland of the domestic cow compared with the strictly normal gland of the buffalo cow, while a gland enlarged by an adenoma—a gland-like tumor—is never more active and usually much less active than a strictly normal gland.

Pathologists recognize two distinct kinds of tumors—those which are formed from epithelial cells and those which are formed from connective tissue cells. Cancers belong to the first class.

Tumors of both classes closely resemble normal tissue in their nutrition, and they usually have about the same nerve supply. As the tumor increases in size, the blood supply is more or less affected and thus the cells composing the tumor are placed in a different environment, which quickly reacts upon their structure and function. Owing to this fact, the clear distinction between cells of different tissues, which exists in normal structures, becomes more or less obliterated, and in many cases these distinctions become so illy defined that the positive identification of a given tumor becomes a matter of extreme difficulty or in some cases an impossibility.

I am aware that the foregoing views are quite out of harmony with the views of many writers and lecturers on pathology, but I believe that the laboratory experience of practical workers is in harmony with the views expressed.

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*WHICH WEIGHS THE MOST THE EGG OR THE CHICKEN WHICH COMES FROM THE EGG?

This question has been guessed at a number of times, but I do not remember ever having seen exact data given in regard to the matter. With a view of answering the question with scientific exactness, Dr. J. O. Hunt, of Los Angeles, carried a fertilized and an unfertilized egg through the whole process of incubation with the results given below by the eggs indicated by A and C. More than a year after Dr. Hunt's experiments, I carried eggs B and D through the same treatment. The tabulated results are here presented.

*Bulletin So. Cal. Acad. Sci., Dec., 1906.

Days	A.	B.	C.	D.
1	.573 gr.	.590 gr.	.387 gr.	.552 gr.
2	.586	.603	.420	.586
3	.614	.608	.483	.563
4	.543	.601	.400	.574
5	.569	.594	.433	.583
6	.542	.602	.407	.356
7	.583	.593	.431	.394
8	.543	.595	.425	.399
9	.660	.599	.484	.400
10	.682	.594	.508	.409
11	.497	.714	.386	.658
12	.693	.693	.536	.649
13	.481	.654	.278	.603
14	.567	.633	.526	.559
15	.570	.622	.430	.587
16	.582	.601	.434	.503
17	.656	.594	.481	.501
18	.574	.602	.409	.409
19	.714	.604	.492	.386
20	.824	.603	.418	.351
21		.604		.309
22		.796		.250

Egg A weighed at beginning of incubation 59.76 g., and during the process of incubation lost 12.053 g., or a little more than 20 per cent.

Egg C, a sterile egg subjected to the same treatment, lost 8.768 g., or 15.5 per cent.

Egg B weighed at the beginning of incubation 62.842 g., and during the time of incubation lost 13.699 g., or 21.64 per cent. The chick hatched from the egg weighed 44.204 g., or 18.638 g. less than the egg before incubation, a loss of 29.65 per cent.

Egg D was so violently shaken previous to incubation that it was killed. Its treatment was the same otherwise as Egg B. The loss of egg D during incubation was 10,571 g., or a loss of 17 per cent.

*DEGENERATES.

One does not read modern magazines very extensively without seeing some reference made to degeneracy. Although our knowledge of the subject is of recent origin, considerable literature relating to it is already accessible. A large part of this is scattered through magazines and other periodicals, but a few books of real value are wholly devoted to discussion of this most practical and interesting question. Among these may be mentioned "Degeneration," by Prof. Max Nordau, "Degeneracy, Its Causes, Signs and Results," by Dr. Eugene S. Talbott, and a work on "Degeneration," by Dr. Hirsch.

In the present article I have no intention of materially increasing the stock of information on this subject, but rather of putting in a condensed form the work which has already been done by others.

Degeneracy may be defined as a failure on the part of the individual to reach the state of perfection attained by his (or its) ancestors, and the inability to transmit to the next generation the peculiarities which mark the degenerate, though the descendants are seldom or never free from some serious defects. It is this latter fact which distinguishes a "degenerate" from the beginning of a new species or race. Fortunately for the dignity of life, degenerate plants and animals at last lose their powers of reproduction and so become self-limiting. Marked degeneration is possible only when the degenerate can act as a parasite.

Conversely, parasitism always leads to degeneration, the amount of which is closely proportioned to the extent of the parasitical habits. Without parasitism, the tapeworm could never have lost its alimentary canal and other digestive organs. Even a slight tendency toward their degeneration before parasitical habits were well established would have been fatal to the whole race, and human parasites, criminals and incompetent people, can live only through the charity of their more highly developed brethren. Volumes might be written on the causes, nature and biological significance of animal degeneration, but in this article I shall confine myself to the human aspect of the case, only where some illustration drawn from zoölogy or botany will make my meaning more clear. All scientists admit that each animal in its individual development recapitulates more or less perfectly the history of the race to which it belongs. Thus the frog when first hatched is

*The Osteopath, P. S. O., May, 1900.

essentially a fish, but by a series of changes it develops into what is practically a reptile. Its development before hatching is no less remarkable, for it begins life as a unicellular organism and grows into a fish, before it attempts any independent life. Some parts of its egg development closely parallel the development of worms, and we have every reason to believe that in a general way the race has traveled the road over which the individual now goes. Like the frog, man begins his life as a single cell and passes through about the same stages as the frog, and then continues his upward course until he reaches the full stage of human development.

The limbs of man develop from the same embryological structure as do the fins of fishes. In degenerates one or even all of the limbs may remain in the finfold state and never develop, or while the arms or legs are arrested in their growth the other limbs (legs or arms) may grow in a perfectly natural way. Some of the bones of one or both pairs of limbs may remain undeveloped while other bones in the same limbs may attain normal size.

Thus in one recorded case, the humerus and radius and ulna were suppressed, but the lower bones were perfectly normal, so this unfortunate had two well formed hands projecting from the shoulders.

In a number of cases the lower limbs have been completely fused together. The number of ribs is subject to variation. It is seldom that the number is less than normal, and in the great majority of cases where degeneracy is marked by an increased number, thirteen pairs are found. This is the number found in the anthropoid apes, most nearly related to man. The patella bone is frequently absent in degenerates.

There is strong evidence that in ancestral forms a close relationship existed between what is now the central nervous system and the alimentary canal. In embryonic life the lumen of the spinal cord and alimentary canal are connected by what is known as the neurenteric passage or canal. This place is occasionally the seat of degenerate conditions, which may so expose the spinal cord as to render life precarious. In England alone six hundred and forty-seven deaths were reported from this cause in 1882 and of this number six hundred and fifteen were children under one year of age.

The heart is sometimes very imperfectly developed. It has been found in almost all stages, from a mere pulsating tube up to a perfect mammalian heart. Strange to say, a very poorly developed heart has sometimes performed its functions well. When the embryonic condition of an open foramen ovale persists after birth the child is popularly called a "blue baby."

Various forms of physical degeneration which do not seriously affect the intellect are so common that I shall pass them over briefly. They may be divided into two classes which are not always easily distinguished from each other. One class comprises those cases where the deformity bears no relationship to ancestral conditions. Such are the microcephalous, macrocephalous and hydrocephalous monsters, and cases of supernumerary ears, limbs and digits as well as those with two or more heads. The other class of degenerates are those of atavism or a reversion to an ancestral form. This does not imply the possession of simply rudimentary organs, for the bodies of higher animals are pretty well filled with these, but it means that some organ which is usually suppressed becomes developed to such an extent as to be of functional value. The mental and moral degenerates are criminals and imbeciles. There seem to be at least two classes of criminals: accidental criminals and natural criminals. The accidental criminal is one who has been led into crime by some strong and temporarily overmastering temptation. Nothing is more sad than criminality of this kind, and these accidental criminals not infrequently "rise from their dead selves to higher things."

The natural criminal is believed by Lombroso and other criminologists to represent a distinct variety of human race. As children they are frequently deformed, puny, sickly, inclined to scrofula, with peculiar shaped heads, insignificant in hearing and markedly deficient in energy. Mentally they are inclined to be stupid, subject to fits, sluggish in movement, and at the same time petulant, and often incorrigible. As adults their heads are irregular in outline, sharp and angular, and they have a stupid and insensate look. Serious physical deformities, such as club-feet, cleft-palate, hare-lip, hump-back and general asymmetry of the body, are not uncommon among them. Especially are the eyes likely to lack symmetry.

In homicides it has been noted that the angle of the ear with the temporal bone is generally large, approaching 90°. In habitual thieves the angle of the ear is generally somewhat less, but still greater than is that of perfectly normal individuals.

Albinism or deficient pigment in the skin is often associated with serious moral and intellectual weakness and is frequently combined with imperfectly developed spleen, liver, pancreas and kidneys.

The imperfect and irregular action of the lungs arising from the imperfectly developed face, jaws, palate, nose or chest, may result in an irregular blood supply to the brain. This may result in lowering the intellectual and hence the moral tone of the individual.

In 1886 Dr. Henry D. Chapin expressed the opinion that the inefficient and criminal classes are an inevitable by-product of our complex modern civilization. Evils are always "inevitable" until we know how to deal with them, but when we have learned how to deal with them it is surprising to note how soon they cease to be "inevitable." One need not go very far back in the history of Anglo-Saxon philanthropy to find the time when it was supposed to be desirable to lift the imbecile to a plane where he could support himself, and assume a more or less independent condition among his fellow men, and it was supposed to be equally desirable to so improve the natural criminal that he could spend at least enough time outside of jails and penitentiaries to enable him to marry and raise a family. The state still stands ready to license the marriage of physical and mental degenerates—the imbecile and the criminal—and the church gives them her blessing and bids them "be fruitful and multiply." One important step in the *real* redemption of man will have been taken when this maudlin sentimentality shall have come to an end.

Every human being, the most degenerate as well as the most highly endowed, is entitled to life and its comforts, and as much liberty as is consistent with the safety of others, but when one is a well-marked degenerate of any kind he should never be permitted to perpetuate his race. Instead of sending the young criminal—the natural criminal—to the reform school until he is of age, and then turning him loose and granting him permission to marry and raise a family, which experience shows will generally inherit his bad tendencies, he should be placed in some institution for life where he can be of use to himself and to others, but where he can leave no descendants to follow in his steps.

Frequently a considerable part of the mature life of such a man is spent in criminal pursuits, and he is on the whole a nuisance to his own generation, and his children become the "problems" of future generations. As a matter of simple justice to the future, no degenerate should be allowed to have descendants. His life should be made as happy and comfortable as possible, *but he should be the last of his race.* One serious obstacle stands in the way of reform in this direction, and that is the difficulty of accurately recognizing degenerates. Careful and thorough study of all the phases of degeneration must precede any wise movement toward regulating the lives of degenerates. The field is a new one and practically unoccupied now, but the work will be taken up in good earnest in the near future. Why should not Osteopaths specialize in this direction? The old school of the healing art has raised the treatment of insanity from "casting out devils" to a truly scientific method. Shall they be left to deal with the problems of degeneration alone, or shall Osteopaths fit themselves for at least intelligent coöperation?

In conclusion I only wish to remind Osteopaths that the standing of Osteopathy will be largely measured by the value of its contributions to the world's betterment. To develop as it should it must not only be a method of curing disease, but it must assist in the solution of the biologic social problems which confront us.

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*ALBUMIN AND CASTS.

Slight albuminuria may indicate Bright's disease or nephritis in a very incipient condition. It may also indicate either acute or chronic inflammation of the urinary tract. It is by no means unusual in heart lesions, in hepatic sclerosis, and where abdominal tumors are of sufficient size to interfere with the circulation of the blood. In fact, albuminuria may indicate almost any urinary or systemic perversion.

It is perhaps safe to say that nephritis never exists for any considerable time without more or less albuminuria. In many cases, however, of unquestioned nephritis, it is not a constant condition. Associated with albuminuria is the passage of hyaline casts. As a result of a good deal of work and reasonably close observation I have become convinced that many of our text books place an exaggerated diagnostic value upon hyaline casts. I have become convinced that disturbances of the system which are very trifling, and which are not far-reaching in their results, may lead to the elimination of these casts. It is the exception rather than the rule not to find hyaline casts in the urine of people over forty years of age who come under clinical examination. In a number of cases which I have had an opportunity of studying with some degree of care, these casts are so constantly present that they almost lead one to think of them as physiological rather than a pathological condition. It of course must not be forgotten that a moderate albuminuria accompanied by hyaline casts may be the forerunner of an extremely serious condition. On the other hand, as before hinted, they may exist for years without serious conditions manifesting themselves.

*West. Ost., March, 1911.

*SPERMATOZOA.

The spermatozoa, or male reproductive cells are the smallest cells found in the mammalian body, and they constitute the only good example which we have of flagellate cells in the bodies of the higher animals. A number of unicellular organisms are examples of flagellate cells leading an independent existence. Of the numerous ones which might be cited I shall mention only the Euglena. Each spermatozoan consists of a head, mostly composed of nuclear substance with a more or less conspicuous head cap at the anterior end. When this head cap is clearly defined it is sometimes spoken of as the acromosome. The head is surrounded by a thin layer of cytoplasm which also more or less completely invests the tail. Immediately posterior to the head is the middle piece containing a body which is probably the centrosome, and posterior to the middle piece is the axial filament. It occasionally happens that the filament which is surrounded, as already stated, to a greater or less degree, by the cytoplasm, projects through this envelepe at its posterior end. When this condition is found the projecting portion is frequently spoken of as the End Piece and the staining reaction of this structure indicates its relation to the nucleus.

During the last year I have made somewhat of a critical study of the spermatozoa of seven different animals. The species studied included man, the dog, the rabbit, the bull, the mouse, the cat and the rat. In all of these I find that the head breaks off very readily if the spermatozoa are immersed for any length of time in cold water. The tendency for this division to occur is less marked in warm water, and very decidedly less in a normal salt solution. The media in which the spermatozoa are placed also exercise a marked influence upon their vitality. They are, of course, quickly killed when placed in any of the fixing media commonly used in histological laboratories. Their vitality is maintained for only a short time in pure water. They die very quickly in cold water and live not very much longer in water at the temperature of the animal body. Under favorable conditions the spermatozoa of the cat and man will live for forty-eight hours and possibly even longer in a normal salt solution. In no case which I have had an opportunity of studying with care do they retain their vitality for any length of time in the testicle. Even when the testicle is removed from the living animal and immediately placed in a warm normal salt

*West. Ost., Feb., 1908.

solution the spermatozoa die within a few hours. Fine specimens may be stained by the carbolfuchsin method, or by Gram's method. Methylene blue followed by eosin also gives fairly good results and I have been greatly pleased with some specimens stained with iron haematoxylin. I have been unable to find a method by means of which the tails will retain their stain for any great length of time, unless the heads are much over stained.

MAN AND DOG.

While the spermatozoa of the man and dog possess some individual peculiarities in the fresh state they are so much alike when stained that it is extremely difficult to recognize the difference between them. On the whole, the head of the human spermatozoan stains rather more deeply than does that of the dog, and it is rather more pointed at the anterior head. The head of the spermatozoan of the dog is more oval in shape and the anterior end stains very lightly. The tail is, upon the whole, somewhat longer than the human as the subjoined measurements will show. The dog from which these specimens were taken weighed about forty pounds and was an old dog.

MAN.		DOG.	
Total length	.049— .06 m. m.	Total length	.06— .07 m. m.
Length of head	.004—.0065 m. m.	Length of head	.003—.0035 m. m.
Width of head	.003— .004 m. m.	Width of head	.0015— .002 m. m.
Length of tail	.04— .05 m. m.	Length of tail	.055— .06 m. m.

CAT.

The spermatozoa of the cat differ somewhat from those of any of the other animals in this series, inasmuch as when the specimen is fixed in ether and alcohol the tail shows distinct fibrillæ which sometimes divide in the middle piece and appear to pass forward and nearly or quite envelope the head in a net-work of fine achromatic threads. In several specimens which I studied carefully the heads are found to vary in a marked degree in size and shape.

Total length	.056— .076 m. m.
Length of head	.0035—.0075 m. m.
Width of head	.0025— .003 m.m.
Length of tail	.05— .07 m. m.

MOUSE.

The head of the spermatozoan of the mouse stains deeply. The chromatic part of the head is surrounded by a nearly transparent envelope. The anterior end of the head is provided with a curiously curved projection which might be compared to a horn.

Total length	.1	.165	m. m.
Length of head	.0083	.01	m. m.
Width of head	.0025	.0035	m. m.
Length of tail	.115	.14	m. m.

BULL.

There is a marked tendency for the head to break off from the tail in the spermatozoan of the bull. This is so marked that difficulty is sometimes experienced in finding complete spermatozoa. The centrosome stains much more deeply than the head, and the tail takes the stain more readily than it does in most other forms which I have examined.

Total length	.085	.095
Length of head	.008	.01
Width of head	.0055	.0065
Length of tail	.075	.086

RABBIT.

The spermatozoa of the rabbit closely resemble that of the dog, the most striking difference between the two being the tendency of the tails of the spermatozoa of the rabbit to form complicated curves and frequently to become entangled with each other.

Total length	.05	.07	m. m.
Length of head	.0055	.0065	m. m.
Width of head	.003	.0045	m. m.
Length of tail	.04	.06	m. m.

WHITE RAT.

The spermatozoa of the rat differ widely in appearance from that of any other of the mammals in this series. In some respects they resemble the spermatozoa of the barn-yard cock. The heads are crescentric in shape and the concave border stains more readily than any other part of the head.

Total length	.22	.24	m. m.
Length of head	.013	.017	m. m.
Width of head	.005	.007	m. m.
Length of tail	.21	.23	m. m.

*OUR NATIVE BIRDS.

Dr. Elliott Coues, in his "Key to North American Birds," which by the way is a rare combination of poetry and science, says: "There is every reason to believe that a bird is a greatly modified reptile, being the offspring by direct descent of some reptilian progenitor; and there is no reason to suppose that any bird ever had any other origin than by due process of hatching out of an egg laid by its mother after fecundation by its father."

Notwithstanding the lowly origin thus assigned to birds, their grace, their beauty, their songs and their practical usefulness combine to render them worthy of the most careful study and attention. Until recently naturalists deemed it beneath their dignity to study a bird until it was dead, and to insure proper dignity even then, it was necessary that the bird should have been killed. Audubon and Wilson were two marked exceptions to the foregoing statement, but even their influence was insufficient to awaken an interest in living birds. Recently, however, the tide seems to have turned, and now all over our land birds are being studied in their native haunts, and the student of ornithology is quite as likely to be armed with a field glass as with a gun.

Much good work is being done in this line by the teachers and pupils in our public schools, and it is in the hope of aiding this work that I present a classified list of the birds living in Utah.

It is highly improbable that I have the names of all of our native birds, but I am quite sure that no bird has been admitted to this list which is not a native.

As all readers may not be familiar with the nomenclature which I use, a brief explanation of it will perhaps prove useful.

All animals belong to the kingdom animalia. All of the animalia which have backbones belong to the sub-kingdom vertebrata. Those vertebrata which are feathered bipeds are members of the class aves, or birds. The aves are divided into thirteen divisions, known as orders, which are founded on well-marked characteristics. The divisions of the orders are called families, and each family is composed of one or more groups known as genera (a single one is a genus). Each genus consists of one or more birds, known as species. The species composing a genus closely resemble each other, but each one has some special

*Pub. in Salt Lake City, Utah, May, 1898.

peculiarity. In some cases the difference between two birds is not enough to entitle them to rank as two species, and one of them is called a sub-species.

The scientific name of an animal consists of the generic name, followed by the name of the species. Thus the domestic cat belongs to the genus Felis and to the species domestica. Its scientific name is Felis domestica. If the animal named ranks as a sub-species, the name of the sub-species follows the specific name. Thus our most common robin is the Turdus migratorius, while a bird slightly larger, living in the mountains, is a Turdus migratorius propinquus.

The largest and most important order of our native birds is the

ORDER PASSERES.

The word "passer" means a sparrow, and this bird is a type of the order. All of our perching and song birds are Passerine birds.

The toes are four in number and the birds usually move by hopping when on the ground rather than by walking, but they are essentially flying birds, and seldom attempt a journey of any magnitude except on the wing.

Our native species are as follows:

(Initial letters are used to abbreviate wherever possible.)

Turdus migratorius Robin; T. M. propinquus, Allied Robin (a species found in the mountains); Turdus unalascae auduboni, Audubon's Hermit Thrush; Oroscoptes montanus, Mountain Mocking Bird; Mimus carolinensis, Cat Bird; Harporhynchus crissalis, Crissal Thrasher; Cinclus mexicanus, American Dipper (a curious bird found along our canyon streams); Sialia mexicana, Western Blue-Bird; S. arctica, Rocky Mountain Blue-Bird; Lophophanes inornatus, Plain Titmouse; Parus montanus, Mountain Chickadee; Campylorhynchus brunneicapillus, Cactus Wren; Catherpes mexicanus conspersus, Canon Wren; Troglodytes domesticus parkmani, House Wren; Eremophila alpestris leucolaema, Shore Lark; Dendrœca æstiva, Golden Warbler; D. occidentalis, Western Warbler; Hirundo erythrogastra horreorum, Barn Swallow; Petrochelidon lunifrons, Mud Swallow; Cotile riparia, Bank Swallow; Ampelis garrulus, Bohemian Waxwing; A. cedrorum, Cherry-Bird (both of the above named birds are remarkable for their general beauty and their fine topknots); Lanius borealis, Butcher-Bird; Hesperophona vespertina, Evening Grosbeak; Passer domesticus, Common Sparrow; Carpodacus cassini, Purple Finch; C. frontalis, Crimson-Fronted Finch; Leucosticte atrata, Rosy Finch; L. tephrocotis litoralis, Baird's Rosy Finch; Astragalinus tristis, Yellow Bird; Plectrophanes nivalis, Snow Bunting; Melospiza palustris, Song Sparrow; Amphispiza bilineata, Sage Sparrow; Junco hiemalis, Snow-Bird; J. h. oregonus, Oregon Snow-Bird; Guiraca cœrulea, Blus Grosbeak; Pipilo aberti, Gray Towhee; Dolichonyx oryzivorus, Bobolink; Molothrus ater, Cow-Bird; Agelaeus tricolor, Red and White Marsh Black-Bird; Xanthocephalus icterocephalus, Yellow Headed Black Bird; Sturnella magna, Meadow Lark; S. neglecta, Western Meadow Lark; Icterus bullocki, Bullocks Oriole; Corvus corax, American Raven; C. frugivorus, Common Crow; Pica rustica hudsonica, Magpie; Cyanocitta stelleri macrolopha, Crested Jay; Alphelocoma floridana woodhousii, Woodhouse's Jay; Tyrannus carolinensis, King-Bird; Myiarchus cinerescens, Crested Flycatcher.

ORDER PICARIAE.

The Picarian birds constitute an illy defined group of land birds with straight bills and four toes. In one large division of this order (the wood-peckers) the toes are in pairs, two in front and two behind. Antrostomus vociferus arizonae, Arizona Whipperwill. (So far as I can learn this bird occurs only in the extreme southern part of the state.) Chordediles popetue henryi, Night Hawk; Trochilus alexandri, Humming Bird; Selasphorus rufus, Red-Backed Humming-Bird; S. platycercus, Broad-Tailed Humming-Bird; Ceryle alcyon, Kingfisher; Coccygus erythrophthalmus, Black-Billed Cuckoo; Picus scalaris, Woodpecker; P. villosus harrisi, Harris Woodpecker; P. pubescens gairdneri, Gairdener's Woodpecker; Melanerpes erythrocephalus, Red-Headed Woodpecker; Colaptes mexicanus, Red-Shafted Woodpecker.

ORDER RAPTORES.

These are the birds of prey. Their toes are four in number, and are fitted for grasping. The beak is strong and hooked at the end. Most of them are birds of powerful flight. Those which seek their prey at night are the Owls, while the others are the Hawks, Eagles, Buzzards, etc.

Bubo virginianus arcticus, White Horned Owl. (This owl occasionally strays as far south from his northern home as Salt Lake City. So far as I know he is found here only in the winter.) Scops asio bendirii, Screech Owl; Asio wilsonianus, Long-Eared Owl; A. accipitrinus, Short-Eared Owl; Nyctea scandiaca, Snowy Owl; Speotyto cunicularia hypogæa, Burrowing Owl; Accipiter fuscus, Sharp-Shinned Hawk; Astur atricapillus, Chicken Hawk; Buteo borealis, Red-Tailed

Buzzard; Aquila chrysætus, Golden Eagle; Haliætus leucocephalus, Bald Eagle.

ORDER COLUMBAE.

The Pigeon is a type of this order. The bill is horny in structure, and the nostrils open into a tumid membrane at its base. The toes are four in number, and occasionally a slight web is found connecting them. Columba fasciata, Band-Tailed Pigeon; Zenaidura carolinensis, Wild Dove.

ORDER GALLINAE.

This order includes the scratching birds and the domestic fowl, the turkey, the pea-fowl and the Guinea fowl are familiar examples. Meleagris gallipavo americana, Wild Turkey; Canace obscura, Gray Grouse; Centrocercus urophasianus, Sage Hen; Pediœcetes phasianellus columbianus, Sharp-Tailed Grouse; Bonasa umbella umbelloides, Ruffed Grouse; Lophortyx gambeli, Arizona Quail; L. californica, Valley Quail. (This beautiful bird appears to be an introduced species, but in some parts of the state it is becoming abundant.)

ORDER LIMICOLAE.

The birds are frequently called shore-birds, from the fact that they are usually found along the shores of lakes and ponds and occasionally along river flats. Their food consists of worms, insects and other forms of small soft animals, which they pick from the water. Aegialites vociferus, Kildeer Plover; Ae. semipalmatus, Ring Plover; Podasocys montanus, Mountain Plover; Recurvirostra americana, American Avocet; Phalaropus fulicarius, Red Phalarope; Actodromas bairdi, American Stint; Symphemia semipalmata, Willet; Numenius longirostris, Sickle-Billed Curlew.

ORDER HERODIONES.

The birds of this order are mostly large and the legs are long. They usually live in lonely bogs and swamps. Their food consists of fish, frogs and small reptiles. The bill is stout and long. Plegadis guarauna, Ibis; Ardea herodias, Blue Heron; Herodias egretta, White Heron; Nyctiardea grisea nævia, Night Heron; Botaurus mugitans, American Bittern.

ORDER ALECTORIDES.

The external characteristics of this order are so much like the last that the casual observer would see little on which to found a separate order. Grus pratensis, Sand Hill Crane; Porzana carolina, Common Rail; Fulica americana, Mud Hen.

ORDER LAMELLIROSTRES.

Domestic Geese and Ducks are examples of birds belonging to this order. Cygnus buccinator, Trumpeter Swan; C. columbianus, American Swan; Anser albifrons gambeli, White-Fronted Goose; A. hyperboreus, White Brant; Bernicla canadensis, Wild Goose; Dendrocygna fulva, Tree Duck; Anas boscas, Mallard Duck; Dafila acuta, Pit-Tail Duck; Chaulelasmus streperus, Gray Duck; Mareca americana, Bald-Pate Duck; Querquedula carolinensis, Green-Winged Teal; Q. cyanoptera, Cinnamon Teal; Clangula islandica, Rocky Mountain Garrot; C. albeola, Butter-Head Duck; Somateria mollissima dresseri, Eider Duck; Mergus serrator, Red-Breasted Duck.

ORDER STEGANOPODES.

These birds are provided with a pouch under the chin in which the prey is sometimes kept before it is swallowed. Our most common species is the Pelican. This bird is very destructive to fish, but it partially atones for this serious fault by devouring large numbers of frogs, which feed upon about the same material as fish. Pelecanus trachyrhynchus, American White Pelican; Phalacrocorax dilophus, Cormorant.

ORDER LONGIPENNES.

As the name of the order indicates, these birds have long wings and are well fitted for prolonged flight. So far as is at present known, only two species are found in Utah. Larus argentatus smithsonianus, Herring Gull; L. californicus, Californian Gull. (This is the gull so common around Great Salt lake.)

ORDER PYGOPODES.

The birds belonging to this order have their legs so far back on the body that they are forced to stand in a nearly erect position. They are strong swimmers and have good powers of flight. While they are mostly marine birds at least three species are found around Utah lake and Great Salt lake. Colymbus torquatus, Common Loon; Aechmophorus occidentalis, Western Grebe; Podicipes auritus californicus, Eared Grebe.

It is highly improbable, as I have before stated, that the foregoing list includes all of our birds, but I feel quite sure that every bird which has been named is found within the state and most of them breed within our borders. Public interest demands the extermination of the sparrow, if that were possible, and the reduction in numbers of the pelican. All of our other birds should be protected as the harm they do is small, when compared with the benefits they confer.

PART III.
Osteopathic Education

*ADDRESS TO P. S. O. GRADUATING CLASS, 1900.

Let me advise you to be in no haste to define Osteopathy. The history of the healing art shows that it has been eminently progressive, and we certainly have little reason for supposing that Osteopathy, as we understand it today, is a finality. When definitions and creeds are formulated they always express the broadest truth known to their makers, but as knowledge broadens they become a hindrance to progress. The creed of one generation is the prison in which the intellect of the next is too often confined.

Let Osteopathy be free to grow. Let every Osteopath be an investigator and let him discover as much new truth as he can, and let Osteopathy be broad enough to receive this new truth. Whatever is true in the art of alleviating human suffering will prevail, and the Osteopaths of today will be very unwise to prevent Osteopaths of the future from using such means of curing human ills as shall be proved effective. Whenever an organization, be it church, political party, medical school or any other, shall found itself upon a deeper devotion to truth than to preconceived ideas or creeds, that organization will be world-conquering. The attitude of the man who is intellectually free is expressed in the thought, "Let me know the truth; I care not for my previous views only so far as they were true; I will welcome investigation in every line, and I will cheerfully abandon any intellectual position so soon as I see that it is not in harmony with truth." Only men in harmony with this thought can advance the world. Never seek the fatal help of class legislation. Encourage investigation in every direction. Accept new truth from without as well as from within. Count that man as your friend who shows wherein you are wrong. Herbert Spencer once said, "To save men from the consequences of their own folly is to fill the world with fools." To save any organization from the consequences of its conservatism is to prevent its further growth.

Welcome competition, challenge investigation, keep up with scientific progress, love truth better than you love your ideas of truth, and your reward will be the consciousness that you are helping in the grand evolution of the progress of mankind.

*Pub. The Osteopath, P. S. O., July, 1900.

*THE PLACE OF PHYSICIANS IN MODERN SOCIETY.

Modern society is readjusting itself along all lines. Such readjustment must eventually be made because of the increase of knowledge among men.

Socially, we are studying anew the great problems concerning the distribution of wealth. We are concluding that it is very much more important to prevent poverty than it is to give in charity.

Politically, we are growing out of the thought that "to the victor belongs the spoils," and growing into the higher and nobler thought that "a public office is a public trust."

Religiously, we are concluding that it is much more important to make better the present conditions of life than to undertake to make provisions for a future of which at best we can know little.

Around medical lines we are paying much more attention to the prevention of disease than did those who went before us. It is by no means easy to deal justly with the physician and medical art of the past. The old family physician, the kind sympathetic friend, the brave night rider, are still pictures from which we can not willingly divorce ourselves. But there was another side to all of this. The sympathetic physician and loyal friend certainly poured drugs, "of which he knew little, into bodies of which he knew much less," and he certainly had a tendency to obscure the nature of the disease and the treatment which he gave for its alleviation. Perhaps it may be said in his justification that he never made these things more obscure in the minds of his patients than they were in his own mind. For, to tell the truth, he had not even a hint of the real nature either of the disease or its rational treatment. Disease to him was some kind of a terrible entity which got into the body and which, in some way, must be expelled and for the means for its expulsion he ransacked earth and sea for nauseous poisons.

The modern conception of disease is altogether different. We have learned that contagious and infectious diseases result from organisms which enter the body, but we think of these as causes rather than the disease itself, and since we recognize the fact that disease has a cause we believe that it is, for that very reason, preventable. One can not do another a greater service than to impress upon him the solemn importance of a life-work and to teach him that it is only by the preser-

*Address to P. C. O. Graduating Class, 1909. Pub. in West. Ost., Aug., 1909.

vation of health that this life-work can best be accomplished. It is vastly more important to prevent disease than to alleviate it when it has become established.

Death, so far as we are able to see, is a vital necessity. The living cell runs through a series of changes and at last its vitality is exhausted and its death is inevitable; but this should take place only in the extreme age of the cell; and what is true of the single cell is equally true of the great aggregation of cells which we call individual plants, animals and persons. If this view is true it means that death is as unnatural to the young as it is natural to the old. Few things should strike us as being more lamentable than the death of children. All sorts of consolations, which are inclined to make us reconciled to this terrible thing, are simply words which blind us to the wrong which we do when we permit the conditions to exist which cause this blot on the fair face of nature. Poet and preacher are alike at fault when they try to cast the soft light of poetry or religious consolation around an event of this character. Longfellow sings, "My Lord has need of these flowerets fair." The public hygienist, with perhaps less poetry, but much more truth, tells us "the Lord has need of the flowerets fair" in proportion as the milk furnished these 'flowerets' is unclean and contaminated by the germs of disease. Does this line of thought leave us without hope or consolation when our dear ones die? I think not. I think it offers us a rational source of comfort in the place of artificial and irrational comfort. The comfort offered by science is that the grief-stricken parent or friend should cultivate his philanthropy and unselfishness to such an extent that he shall say, "Out of my great grief good shall come, because I solemnly dedicate my life to helping to find means which shall prevent others from suffering as I have suffered," and our world is built upon such a plan that the truest alleviation for all our griefs is to try to alleviate the sorrows of those who are around us.

As each successive class goes out of our college it is highly important that they be thoroughly trained in all that makes for good public hygiene. Each year must see better hygienic conditions and in the great work of improvement the physician must be the leader. If the Pacific College has succeeded in training this class in such a way as to make them intelligent leaders in this great movement, it has wrought a good work and justifies its existence in this community.

*THE COURSE OF STUDY IN OSTEOPATHIC SCHOOLS.

It is said, and probably with truth, that pedagogy is at a low ebb in professional schools, and it will be greatly to the credit of osteopaths if, in their schools, attention shall be given, not only to the subjects studied, but also to the manner and sequence of their presentation.

Two things are required to complete the education of the modern physician. He must first be able to ascertain the abnormalities of his patient; second, he must be able to efficiently remove these abnormalities and thus make possible the restoration of his patient's health. So far as his work in the school is concerned, it is frequently found convenient to call subjects enabling him to accomplish the first result, foundation subjects; and those subjects which enable him to intelligently assist in the second result, professional subjects. However useful this division of subjects may be in explanation and discussion, no real line of demarcation exists between them, but they blend by imperceptible degrees with each other.

There is a natural conservatism running through the human mind, which makes us strongly inclined to cling to expressions which at some time expressed the truth as it was then understood. This we observe in every department of thought. Religious creeds are maintained long after they cease to embody the real belief and real thought of the worshippers; social customs are respected long after their significance has been lost, and changeable as fashions of dress are, the deep underlying principles are changed very slowly. No man in civil life ever thinks of wearing a sword, nevertheless all of our Sunday coats are decorated with buttons originally designed to support the sword belt.

In the early days of osteopathy, when its founders were being impressed themselves and were seeking to impress others with the importance of the physical lesion, nothing was more natural than that the science which makes the recognition of the physical lesion possible, should have been regarded as the very foundation of osteopathy, but at the present time when we are understanding more completely the importance of the cell and when we know that the normal functioning of the organism must depend upon the normal functioning of each of its component parts, we must recognize physiology, using the term

*Ost. World, Oct., 1908.

in its broad sense, as the real foundation of all medical education. The term medical is also used in its broad sense, and by it I mean every rational method applied to the recognition and cure of disease.

Physiology rests upon a three-fold base. One of its foundations is anatomy, the science of gross structure, another foundation is histology, the science of minute structure, and the third is chemistry, the science which makes the understanding of cell action possible.

I would not for a moment underestimate the value of chemistry when applied to the analysis of the various bodily secretions, but its fundamental use in medical education is to enable one to thoroughly understand physiology. Pathology is abnormal histology and abnormal physiology, and I believe it has no place in the curriculum of any medical school only as it is presented in close connection with these two subjects; and, as the latter one of these, physiology, rests in part upon anatomy and in part upon chemistry, these two subjects must of course be recognized as having an important bearing upon pathology. Bacteriology should be presented as throwing a strong side light upon many of the problems of both physiology and pathology.

I would pause here to urge that in every case in our curriculums the study of the normal should precede the study of the abnormal. In sputum examination, urinalysis, blood examination, examination of gastric contents, fecal examination and in all others, a careful study of the normal is necessary to enable the student to get any real knowledge from the examination of abnormal specimens.

Embryology should be made one of our heavy courses, as a just appreciation of anatomy, normal and abnormal, as well as many problems of physiology, rests entirely upon a knowledge of this science. I do not think that I put it too strongly when I say that embryology is the key and the only key to anatomy. When we can make our entrance requirements as high as we all wish were possible, I believe the study of embryology should precede the study of anatomy; but as it is frequently necessary to admit students who have not had the careful training which is necessary to enable them to study embryology with profit, it seems better to delay it until a later time in the course, even to the extent of making it follow anatomy. The extremely technical subjects of gynecology, surgery and obstetrics, all rest upon a profound knowledge of the human body, and as any good to be derived from these subjects must come very largely from clinical practice, it seems wise to relegate them to the latter part of the course.

In this hasty sketch of the Osteopathic curriculum, I have omitted saying anything in regard to biology. I will here take space to say that I regard this as an exceedingly important subject in medical education, and I believe that its natural place is in the early part of the student's course. Through this science it is easy to introduce him to some of the fundamental problems of life, and in working upon these problems he acquires much laboratory technique which stands him in good stead during all the rest of his course.

The only excuse which I have to offer for this discussion is that I am truly and deeply interested in seeing the courses in our osteopathic colleges made as strong from a pedagogical standpoint as I feel certain they are from the Osteopathic standpoint.

Nothing appeals more forcibly to the educated person than breadth of thought. All except those who are running in a narrow groove naturally admire the order of mind which is broad enough to admit the possibility of truth outside the boundaries of his own mental horizon.

As practitioners we are continually confronted by evidences of success from the use of methods outside the pale of the "ten-fingered osteopath," and we recognize that all of these methods which yield better results than can be obtained in any other way must eventually be incorporated into our system of practice, but we suspect that occasionally well-meaning people confuse their own ignorance with the supposed deficiency of the osteopathic system. We strongly suspect when an osteopath gravely informs us that the condition of his patient was such that he was obliged to use drugs to secure results, that if the real truth were told he would have been obliged to confess his own ignorance rather than the deficiency of the osteopathic system. The fact is certainly worthy of consideration that the most studious and untiring workers in our profession are those who resort to drugs the most infrequently, and we have a suspicion that those who rush to drugs most frequently are those who know the least about osteopathy.

*THE VALUE OF THE STUDY OF BACTERIOLOGY.

Bacteriology, as its name indicates, is the science which treats of bacteria. By bacteria are meant those extremely minute forms of vegetable life which bring about many diseases and most of the common changes which we observe in matter around us. The souring of milk, the putrefaction of meat, the decomposition of canned foods and the decay of wood, as well as many other like changes, all result from bacterial action.

In the minds of many persons bacteria are regarded with a certain amount of abhorrence, not to say terror. This is because they are so generally associated with disease; but as a matter of fact, while there are a few forms which may find lodgment in the human body and whose action may produce disease, the greater number of bacterial forms are not only harmless, but are positively beneficial. Were it not for bacteria it is probable that the earth would be scarcely habitable, since all decay and decomposition is due to their action. The dead body of an animal kept entirely free from bacterial action would never undergo decomposition, and long before our time, the surface of the earth would have become so deeply covered with dead animals and plants that there would be no room for the living.

As before stated, a few forms of bacteria are associated with disease. Thus, tuberculosis, diphtheria, small pox, mumps, measles, various kinds of fevers as well as a number of other diseases, result from bacterial action, but in the great majority of cases, at any rate, one may fully protect himself against the action of these harmful bacteria by keeping his body in a thoroughly healthy and vigorous state. While some specific bacteria are always associated with these diseases, it is nevertheless true that most of them are unable to find lodgment or to undergo development in the thoroughly healthy body. It is highly probable that one may spend his entire life in the midst of those suffering from tuberculosis, and may inhale the bacilli of tuberculosis daily without contracting the disease, providing he takes proper food, devotes enough time to sleep and otherwise keeps himself up to his best from a physical standpoint. Owing to the fact, however, that in our modern life it so frequently happens that we are more or less physically depressed, it becomes a matter of vital concern to know how

*So. Pasadenan Aug., 1903.

to diminish the number of the bacteria which produce the various diseases. An answer which will fit the greater number of cases consists in the single word cleanliness, and cleanliness in its broader meaning must of course include good ventilation, for it is quite as uncleanly to breathe impure air as it is to eat unclean food.

Moisture is absolutely essential to the life of bacteria; hence dry and well drained places are always much freer from bacteria than places which are moist and where there is decaying organic matter. Indeed, as stated above, the decay is brought about by the action of bacteria. As long as bacteria are in a moist medium it is impossible for them to leave it and get into the air, but when the medium in which they are growing becomes dry, it is an easy matter for them to be picked up by currents of air from which they may settle into food or drink or be inhaled by breathing and thus find lodgment in the human body.

One of the most filthy, dangerous and absolutely inexcusable habits is that of expectorating upon sidewalks, in cars and other public places. Wherever this filthy habit is permitted there is always more or less serious danger to the community at large, for among those who do this there is always the possibility of there being consumptives and those suffering from other diseases which might permit the presence of the specific bacteria of the diseases in the matter expectorated.

It is an interesting thought that in the world of life, as in the social and moral world, it is the little things that count the most. It is of course needless to spend time in arguing that the proper attention to the small civilities of life mark the difference between the ill-bred person and the well-bred person, and in the organic world these microscopical forms of life produce more marked effects than the larger forms. Were all of the elephants and whales in the world to be stricken from existence, most of us would not be seriously affected; were these microscopical forms of life to disappear, the earth would soon be changed to an absolutely barren desert. This statement being true, it certainly should seem that the study of bacteriology is not unimportant from the standpoint of general culture, and from the intimate relationship between certain bacilli and disease, it will readily enough be seen that a thorough understanding of these organisms should form an important part of the education of the physician.

*THE EDUCATION OF THE OSTEOPATH.

There is a serious danger that an increasing number of osteopaths look upon giving a "good treatment" as the sum and substance of osteopathy; the "goodness" of the treatment being determined by the number and variety of the movements which the patient receives. No one who has the slightest interest in the advancement of the profession would intentionally undervalue its technique, but, after all, giving the "treatment" is only technique, and the ability to do it and do it well no more entitles one to be called a physician than does the ability to properly plant a tree entitle one to denominate himself a landscape gardner.

No argument is needed to show that a correct diagnosis of disease must ever precede its rational treatment, and it is in making the diagnosis that the skill and learning of the physician are shown.

The osteopathic profession is rich in members who are strong in what they term "physical diagnosis." By this they mean palpation in its various forms, and the use of the stethoscope and the thermometer. All of these are good, and each of these means should be developed to its utmost; but these are by no means all which the modern physician must use. Blood examination and urinalysis should form a part of the routine examination which every young physician gives his patient. I say "young physician" advisedly, for the physician of long experience may discern at a glance what the tyro would discover only after a long and patient research, just as the experienced mine prospector may safely stride over miles of the mountain side in a day, while the inexperienced prospector must assay a sample from every ledge if he ever expects to become an expert.

In mentioning blood examination and urinalysis, I had no intention of singling them out as of pre-eminent importance in all cases, though I believe they should form part of the routine examination to which every patient should be subjected. It is not a rare occurrence for a patient to pass from one reputable physician to another until he has gone through several hands before the real nature of his trouble is known. This would not be if every physician made it a point of honor to thoroughly investigate every case which he undertakes. The "shot-gun treatments," of which one so frequently hears, are a dis-

*Ost. World, July, 1903.

grace to the profession, and the osteopaths who give them have not the slightest claim to be called physicians. If such work is to be called "osteopathy," then instead of all the better schools putting themselves on a three-year basis, they should be adopting a three-weeks' basis, for any one who has ordinary mechanical ability can learn whatever there is of manipulation in that time. No one who is ignorant of the value in diagnosis, of blood, sputum, gastric and fecal examination, urinalysis, etc., has any moral right to engage in practice, no matter to what school he may belong.

An argument which is used by some practitioners against care in diagnosis is that "no matter what the disease may be, the treatment is substantially the same." Now if this is true, let us have the courage of our convictions, and begin a systematic education of the public which shall result in having a brief course in osteopathic manipulation made a part of the curriculum of the public schools, and thus practically do away with the physician as a representative of a special profession. As this is a manifest absurdity, the right course to pursue is to put the profession on a high, scientific basis. To do this we must recognize the fact that questions relating to life and health are biological problems, and that these problems can be solved successfully only by those who have had careful and thorough preliminary training. As a matter of fact, the physician should be the most thorough of all biologists. His knowledge should include not only the means of curing disease, but the more important knowledge of how to prevent disease.

There is no such thing as "useless information." All information is useful and can be worked into our daily lives as soon as we know how to use it, but a few subjects, such as chemistry, physics, anatomy, histology, physiology, bacteriology, embryology and pathology are absolutely essential to the working biologist, and this the physician pre-eminently is. To be of use to the physician he must know these subjects as he can only know them by studying them upon a laboratory basis.

One can easily determine the limits of a physician's education by knowing what he considers "practical." Whatever one knows how to use is always "practical." What he does not know how to use is always "theoretical." It is sometimes urged that one may get results from purely empirical methods. This is frequently true. With no knowledge of bacteriology one may learn to examine sputum, and to use Widal's test for typhoid fever, as well as to make many other examinations, but knowledge of this kind furnishes no foundation for further progress, and the physician who works in this way is certain to fall sadly behind his more educated professional brethren. Now is the time for osteopathic schools and osteopathic practitioners to unite in insisting that their educational standards shall be high. By doing this, osteopathy cannot fail to approve itself to an intelligent and progressive public, and its future is assured. In every respect the work done in our schools must equal or excel that done in the best schools of the drug system of practice, and our graduates must be thoroughly fitted to fill any public position which representatives of other systems are fitted to fill.

*THE VALUE OF LABORATORY DIAGNOSIS.

The work of the physician is two-fold. He must, first of all, intelligently diagnose the condition of his patient. Unless this is accurately done he has no basis for rational treatment. Having diagnosed the condition of his patient, his next work is to relieve this abnormal condition so far as he can, and assist nature in bringing his patient back to a normal condition.

The work of diagnosis will not unnaturally be conducted in at least two places. A considerable amount of it must ever be done at the bedside. It is there only that he can gain a knowledge of the patient's condition by palpation, observation of the action of the heart and lungs; there only can he get his pulse tracings, observe the temperature and general condition of his patient. But, in addition to these examinations, important as they are, there are yet others which shed great light upon the physiological condition or the pathological condition of the patient. Among these, and perhaps the two most important, are urinalysis and an intelligent examination of the blood.

It seems absolutely essential to the success of the physician that he should have a regular routine examination to which every patient is subjected. This routine examination should consist of the bedside examinations which have already been mentioned and the blood and urine examinations. A careful record of these should be kept, and the examinations should be frequently repeated. In this way he obtains a real knowledge of the progress which his patient is making; and his statement to the patient and to his friends of his condition is

*Report Cal. Ost. Ass'n, 1903.

removed from the realm of guess-work to the realm of absolute certainty.

Aside from the urine and blood examinations, it is frequently necessary for the physician to make or to have made careful and intelligent examinations of the sputum, of gastric contents, and of fecal matter. While in many cases the physician, either from lack of time, lack of facilities, or lack of taste, may not care to make these examinations himself, he should always be able to intelligently interpret the reports of these examinations which he may receive from experts in this line of work.

In all of the better grade of medical schools an attempt is being made to place the knowledge of the human body upon a scientific basis, and osteopaths cannot more certainly discredit themselves in the eyes of an intelligent public than by a failure to perceive the importance of placing all of their work upon an equally scientific basis. Every attempt should be made by the profession at large to bring such influences to bear upon osteopathic colleges that they will not graduate students whose intellectual and scientific attainments are inferior to the attainments of the better grade of students who are graduated from our best medical schools.

Fourteen years ago osteopathy was an unorganized, inchoate method of treating the sick. Today it stands in public estimation shoulder to shoulder with schools of practice which were hoary with age before osteopathy was ever dreamed of.

This wonderful change has resulted from the co-work of practitioners in the field and teachers in the colleges. Had either of these factors been left without the influences of the other, little could have been accomplished. The Pacific College recognizes its great indebtedness not only to practitioners in general but to the other schools.

It has been the constant desire of the college to materially aid in the progress which the profession has made and which it is making. Several members of its faculty have been active along research lines, and each class feels before it completes its connection with the college that it has aided in solving some questions the solution of which will be of value not only to themselves, but to the profession at large.

*THE IMPORTANCE OF LABORATORY DIAGNOSIS TO THE PHYSICIAN.

The profession of osteopathy is confronted by two evils, of which I shall speak briefly. The first one to which I shall refer is the fact that there is a decided tendency for people who are sick to get well. They will get well if the doctor comes very frequently, and they will get well if the doctor does not come very frequently. They will get well if the doctor acts wisely, and frequently they get well if the doctor acts unwisely. It would seem at first that this is not a misfortune; certainly it is no misfortune to the patient; it is no misfortune to the individual physician, but to the profession at large it is somewhat unfortunate, as I shall attempt to show you later. The second evil which confronts us is the fact that all manipulation, whether skillfully performed or unskillfully performed, is beneficial in many cases. No matter if the physician has very little skill, the fact that he causes a relaxation of muscles is beneficial to the patient.

I say these two facts are unfortunate for the profession, and the reason why they are unfortunate is that they lessen the absolute necessity for the thorough education of the physician. If osteopathy is to survive as a system of medical practice, the osteopathic physician must be in no wise inferior in his education and training to the representatives of other systems of practice. There are two duties which a physician must perform when he is called to a case.. The first is diagnosis. Before he can intelligently apply any system of treatment he must know the condition of his patient. When he has ascertained this condition, if he is a wise physician, he proceeds to apply such methods of treatment as shall tend to alleviate the distress or disorder from which the patient is suffering.

There is no royal road to diagnosis. If we osteopaths are in danger from any particular thing more than another, it is the belief that there is a right royal road to diagnosis, and that royal road is by manual examination. If there is any person here who has more faith in the efficacy of the manual examination than I have, the least I can say is that he has great faith. I recognize, as I believe you all do, the careful hand examination of the patient as one of the most important contributions osteopathy has made to the medical profession, and what I shall say in the future is intended in no wise to reflect upon its great value as a means of diagnosis. It is simply one of them. The

*Address, St. Louis meeting of Am. Ost. Ass'n, 1904. Pub. Jour. A. O. A., Oct., 1904.

human body is a very complicated organism, and he who undertakes to recognize the nature of its abnormal conditions must apply every means which is known to science. And before the physician understands the condition of his patient his treatment can only be based upon more or less skillful guess-work; and when he guesses upon a scientific question he usually guesses wrong.

We are all agreed that the manual examination is of prime importance, but the character of the pulse throws a certain amount of light upon the condition of the patient. His temperature tells us something of his condition. An intelligent examination of his blood, together with an enumeration of the blood corpuscles, tells us something in regard to his condition. A carefully made urinalysis tells us something of his condition. And under certain conditions a sputum examination, a gastric examination and a fecal examination will throw still further light upon his condition.

The point to which I especially wish to call your attention is that all of these examinations as indications should be made in studying the condition of the patient. It is the disgrace of the medical profession at the present time that if the patient goes to six different physicians he frequently gets six different diagnoses of his condition. The reason is that the diagnosis is not made with sufficient care, that the condition of the patient is not studied as it should be, and if osteopathy is to rank as it should as the foremost of the schools of medicine, it must be placed in that position by the scholarly character of the members of the profession; and if they possess this scholarly character it will be shown in the greater attention which is paid to this most important of all subjects, that of diagnosis.

It is not very unusual to hear the young physician boast of the large practice which he has. It is not very unusual for him to tell us that all of his time is occupied in the treatment of his patients. As a general thing, these statements are not true. But if they were true it would be disgraceful; and the only thing which the physician advertises when he makes such boasts is his absolute ignorance of the worth of a physician. If the physician feels the responsibility of his profession, if he remembers that human life is in his hands, and then passes from one patient to another as rapidly as he can with his mechanical treatment, and without studying his patients, and studying them carefully, he is a disgrace to his profession, and he stands in the way of its development.

This morning, in conversation with a physician who is not old in years but who is old in his profession, a man with the widest experience in osteopathy, made the remark that he was cutting down the number of his cases, and that every case is receiving more careful study. It is from physicians of this kind that advancement of the profession is to come. In conversation with physicians I have frequently asked their opinion of the value of laboratory diagnosis, and not infrequently the reply has been, "I am not particularly interested in those things; I am more interested in the practical side of the work." I believe that most of you will agree with me that the difference between what most people call "practical" and "theoretical" is that they know how to apply the one and do not know how to apply the other. Any knowledge which any of us possess which we are capable of applying is "practical"; while all the knowledge which we are not capable of applying, all the knowledge which is not connected or linked with some other knowledge, is pushed aside and is called "theoretical."

One of the practical questions which comes to us is how this diagnosis is to be carried on. Shall we as individuals attend to it, or shall it be handed over to the specialist? My answer on that question is, both. The probability is that every physician would do well to carry on a certain amount of laboratory diagnosis himself; that every one should be equipped so that he can make a urinalysis. Every one should be equipped and possessed with sufficient knowledge and skill to be able to determine by a sputum examination whether a patient is asthmatic, or whether he is suffering from tuberculosis. Within the last ten days an examination was made in the laboratory of the Pacific College of Osteopathy, which demonstrated very clearly the presence of tuberculosis. The patient, a lady, had been treated by four different physicians for asthma. It is almost needless to say to you that, however good the treatment of these physicians may have been for asthma, it must have been very illy adapted to tuberculosis, for I think that most of you will agree with me that treatment which may very properly be given to the asthmatic patient might produce a most serious result if given to one suffering from tuberculosis. And yet, as I said before, four different physicians treated this patient for asthma. Do you suppose that if any one of these physicians had made a careful, intelligent, scientific study of that case, such a blunder would have been made? If we are to free ourselves from the possibility of making just such mistakes—mistakes which are disgraceful to the profession and dangerous to society—it must be by educating ourselves up to the point of utilizing every known method of diagnosis, and intelligently applying them. In many cases it is undoubtedly best to refer the examination to some specialist. There are laboratories in almost all of our cities where these examinations can be made accurately, perhaps more accurately than can be made by the average practitioner. Still we must remember that the urinalysis, sputum examination, fecal examination, gastric examination, and all other examinations, no matter how skillfully made, will be of little use to the physician unless he understands the meaning of the report; and if he is going to do this it seems almost necessary that he should keep in touch with the work by doing some of it himself.

I cannot close this talk without expressing to you my deep anxiety to see osteopathy take its place as one of the leading branches of the medical profession, and eventually to supersede all others. If it is to take this place, we must educate ourselves for it. Our pride in osteopathy should not be fully satisfied until health officers and sanitary inspectors of all kinds may be appointed from our profession, as they are appointed at the present time from the other schools. But if they are going to be appointed from our branch of the profession, it can only be brought about by our thoroughly educating ourselves, by our intelligently using every means of diagnosis which is known to science; and when we attend to these things, and when we have placed ourselves upon that high educational foundation, when it will be true that a degree from an osteopathic college stands for as much as a degree from any other college, that it represents as much culture, then, and only then, will osteopathy take the place which I feel certain it is destined to take. It is our high privilege to work for this end. And if we are true to ourselves and to our trust, the goal is not far distant.

The belief is growing among close observers that much of the suffering which patients experience after major operations is due to the drugs which the well intentioned, but misinformed, surgeon uses. It is suspected by more than one that when the unconscious patient receives a "shot" of strychnine to brace up the heart action that he lives in spite of the strychnine rather than because of it.

*SOME FACTS RELATING TO LABORATORY DIAGNOSIS.

The following not closely related papers are presented with the hope that they will be of practical value to the practitioner. While no pretense of originality is made in any case, all of the data given has been verified many times over in the pathological laboratory of The Pacific College of Osteopathy.

All thoughtful physicians are feeling the increasing demand of the laity for greater exactness in diagnosis, and while the most enthusiastic "laboratory man" would deem it preposterous to claim that any complete diagnosis can be made in the laboratory alone, the most conservative among practitioners are more and more availing themselves of the aid which can alone come from the technical pathologist.

MALARIA.

Most contagious and infectious diseases are caused by vegetable organisms (bacteria) which establish themselves upon or within the body, but a few diseases are due to parasites whose affinities are clearly with the animals rather than the plants.

Among these parasites the plasmodium malariæ enjoys the dishonorable distinction of being one of the most common. Its life history is now so well known and methods for its detection are so clearly described that the only object of mentioning it here is to call attention to the fact that malarial fever may so closely simulate several other fevers that it is possible to distinguish them only by means of a blood examination.

It is quite probable that when one becomes infected by the plasmodium the infection is practically permanent. Proper habits of life may so hold the parasite in abeyance that the patient may suppose he is free from them, but if the system becomes debilitated, they at once increase in numbers and an attack of malaria results.

I had an opportunity to make some observations on a case recently where the patient had an attack of malaria after having been free from the disease for seventeen years. The case was at first supposed to be typhoid fever and it was not until the plasmodium malariæ was found in the blood that malaria was more than suspected.

Another case was supposed at first to be puerperal fever, but a

*West. Ost., Jan., 1908.

careful study of the patient's blood proved it to be malaria. It is fortunate for the practitioner that blood in the form of a thin smear may be sent almost any distance for examination by a competent pathologist.

MOLDS AND YEAST IN THE STOMACH AND BLADDER.

It has been known for some time that vomitus and urine are occasionally infected with molds and yeasts, but I think that the importance of such infection has not been fully realized.

Two cases under my observation during the last year were diagnosticated as carcinoma of the stomach by the physicians in charge. In both instances the diagnosis was founded upon the clinical symptoms. A careful microscopical examination of the vomitus and stomach washings of the patients showed large numbers of yeast cells, many of them actively dividing, thus indicating that they were not merely accidentally present. The further treatment was based upon the intention of relieving them from this infection. In both cases the improvement was rapid, and the symptoms of carcinoma disappeared.

In both the foregoing cases the infection was a mixed one. It is quite probable that more than one species of yeast was present, and aside from the yeast there were two species of mold. One species probably was an oidium and the other a penicillium.

Another case which may prove to be of value along this line was a man who suffered from irritation of the bladder. Some of his symptoms were highly suggestive of cystitis, but a careful examination of the urine failed to show any pus. There were, however, considerable quantities of mold found in perfectly fresh samples of his urine. The mold was probably an oidium of some species, and the urine was clearly and sharply acid.

There is no difficulty in understanding how the stomach may become infected with either yeast or mold, as the spores of these organisms are ever present in the air, and consequently are ingested with both food and drink, and whenever the power of resistance of the stomach is sufficiently lowered in any way whatever all of the conditions favorable for infection are present. The means of bladder infection are not so evident. It must rarely happen that this occurs except by the use of the catheter or sound. It would be difficult to emphasize too strongly the necessity for perfect disinfection when either of these instruments is used.

*LABORATORY EXAMINATIONS.

Any pathologist doing general work for the public is likely to be asked from time to time to make examinations or perform analyses which either require the expenditure of a great amount of time, or which are practically impossible. For instance, samples of milk are frequently received and the bacteriologist is asked to determine whether there are any "poison germs" in the milk. By this is usually meant a request for information as to whether typhoid bacilli, the bacilli of tuberculosis, or other pathogenic micro-organisms are present in the samples.

Now, as a matter of fact, organisms of that kind may be present and present in such numbers as to make the milk positively dangerous, and yet the most skillful bacteriologist might either be wholly unable to prove their presence, or if he should prove their presence it would be only by expending many days, and possibly weeks, of time in conducting his examination. The most careful hygienist places little importance upon the positive finding of disease-producing bacteria in milk or any other food product. If bacteria are present in large numbers, the danger of pathogenic forms being among them is clearly recognized. When more than between 500,000 and 1,000,000 bacteria to the cubic centimeter are found in milk, it may be positively assumed that the milk is unfit for food for infants. It is, of course, possible that the number may be very much greater than this and still no pathogenic organism be present, but the danger is too great, from a practical standpoint, to permit such milk to be used.

It is not very unusual to receive medicines of various kinds for chemical analysis. While it is comparatively easy for the competent chemist in a reasonably well furnished laboratory to determine the presence and amount of any inorganic compound, it is by no means easy to determine the presence of organic compounds. If a question is asked as to whether or not a given organic compound is present, the matter is comparatively simple, but if no such question is asked, the matter of determining just what is present may be difficult almost to the point of impossibility. This is due in part to the enormous number of possible compounds which may be present, and it would readily be seen that one might work for days and might require a

*West. Ost., April, 1911.

vast amount of the material if he were going to undertake the analysis without any clew. To make an illustration, I would say that to send an organic compound to a chemist, asking him to determine its nature, would be a little like sending a person to a large department store, asking him to bring you what you want without giving him the least clew as to your particular taste. If it is desired to secure the analysis of an organic compound, a direct question should be asked, as, for example: Is morphine present in this compound, is cocaine present, or any other one or more definite compounds? A question of this kind usually admits of a positive answer.

Smears of pus and other fluids are frequently sent to laboratories, with a request that an opinion in regard to them be given. As a general thing this is very unsatisfactory, both to the physician and the pathologist. If the physician would state plainly what information he desires, the problem would be greatly simplified and the pathologist would be able to render much more satisfactory service. It is not unusual for physicians to send sputum and pus to the pathologist on cotton, in cloth or on paper. Nine times out of ten, when material is received in this way, either nothing can be done or the examination is unsatisfactory to both parties. Either the material should be sent in a bottle properly corked and labeled, or thin smears on cover glasses or on slides should be made. When the material is sent on glass it should first be heated nearly as hot as boiling water before being sent. This will not only kill the organisms present, but will securely fasten them to the glass. Prepared in this way, smears may be transported almost any distance for examination.

The year which is just closing has been very successful from an educational standpoint. Never in the history of the college have students worked with better spirit, and never has work of a higher grade been accomplished. The fact that the work is almost entirely upon a laboratory basis makes it, perhaps, somewhat less attractive to the superficial student, but it tends to insure the attention and consideration of that class of students who finally make the profession.

*THE SIDE OF THE COLLEGES.

The time has come when the profession at large should be deeply concerned in regard to the work and the prospects of our colleges, for the whole future of osteopathy is dependent upon them. All of them have entered upon the basis of a three years' course of study, and sufficient time has elapsed to make it possible to have an intelligent opinion in regard to the value of the added year's work. It has also given us an opportunity to make some observations as to the financial effect of this increase in the length of our course. It is very certain that some students have been deterred from entering upon the study of osteopathy because of the increased length of our course. It is almost equally certain that we have drawn in some students who would never have studied osteopathy had not the course been extended. I am inclined to believe that the number excluded is somewhat larger than the number which has been attracted by the change from a two years' to a three years' course. As the schools are supported almost entirely by tuition this has been a burden somewhat heavy to carry. The profession, on the other hand, has been greatly benefited by the change as the students taking the three years' course are upon the whole superior to those who entered upon the former two years' course. It is impossible to seriously question the great value of the added year's work. Almost every state in re-framing its medical laws requires a rigid examination before licensing practitioners of any sort to begin their professional careers. These examinations are subject to great variations in the different states, but in almost every case a considerable part of the examination is upon the scientific subjects which form the basis of the physician's education. The standard of these examinations is largely determined by the large and richly endowed drug medical colleges and it is no easy matter for the osteopathic colleges, supported almost entirely by tuition, to fit their students to successfully meet these requirements. However, the fact still remains that no amount of endowment, and no amount of equipment, will enable the student to educate himself without personal effort, and on the other hand the most meager surroundings afford opportunities for culture and improvement if the material is wisely used. In other words, what the student gets out of a course is much more dependent upon what he puts into it than upon equipment or luxurious surroundings. As has

*Jour. A. O. A., Jan., 1909.

recently been pointed out, the relationship among the colleges is very far from being ideal and the colleges themselves find it almost impossible to maintain a proper and dignified relationship with their prospective students. The catchy biological term, "survival of the fittest," is so commonly used that we are inclined to accept it as an axiom that the most worthy will live. Whether this is true or not is entirely dependent upon the standard by means of which we measure the fittest. A pollywog will thrive and do well where a canary bird would starve to death. A slime mold will luxuriate where a rose would be smothered. An educational institution dependent upon tuition will survive if it secures a sufficient number of students who are able to pay tuition, and the sufficient number is frequently secured by adopting a very low standard for matriculation and making it very easy for the student to do his work. The school of higher ideals may perish while one of lower ideals may survive.

Briefly stated, competition among unendowed institutions tends to lower the educational standard, while competition among endowed institutions always tends to raise the educational standard. The first survives, if at all, because of the number of its students; the second survives because of the quality of its work.

The practical question, "What can we do to help the colleges?" will present itself to the more thoughtful members of the profession. Probably the most practical benefit which the practitioner can render them is in sending to them thoroughly qualified students. Numbers are necessary to make it possible for the colleges to continue their work, but quality is almost as necessary as quantity, for unless the great majority of students who enter are enabled to fit themselves for the exigencies of state board examinations the colleges might as well close their doors.

In conclusion let me clearly call attention to the somewhat anomalous position which confronts us. The fate of the profession is dependent upon the colleges; the colleges are largely owned and controlled by private corporations. The great majority of the members of the profession are unable to understand the far-reaching importance of the colleges and even in our National Association the vital significance of our educational problem is either overlooked or very imperfectly comprehended. The profession must arouse itself to the recognition of the fact that everything which pertains to the fountain heads from which osteopathy is flowing is a matter of vital importance to every member of the profession.

*THE RELATIONSHIP BETWEEN THE A. O. A. AND THE A. C. O.

Just what the relationship should be between these two bodies is a question by no means easily answered. There is little precedent to guide us, and we are making history as we proceed. A wise and sympathetic relationship between the two organizations will be mutually beneficial and a false relationship will be detrimental to both.

Nothing could be more disastrous to the proper relationship of these bodies than the attempt of either to exercise police supervision over the other. The A. O. A. is composed of members very few of whom have anything more than a friendly interest in the colleges, and for the colleges to undertake a policy which would in any way control them in their organization would be as unwise as it would be disastrous. On the other hand, the colleges have very serious financial problems to solve and increasing responsibilities to their alumni, and it would be a manifest impossibility for them to faithfully discharge these duties if they should suffer any outside body to dictate their policy to them. The A. O. A. should at all times use its utmost influence in promoting a friendly and sympathetic feeling among the alumni of the various colleges.

The A. C. O. is the organization from which the members of the A. O. A. have largely come and from which they will continue to be augmented in the future. It would seem that eventually every college whose graduates are entitled to membership in the A. O. A. must be a member of the A. C. O. It is undoubtedly true that both the colleges and the profession earnestly desire to progress and each will have its special offering to make to this common cause. The experience of the past shows us that a close incorporation, even though it be an educational incorporation, is strongly inclined to be conservative. It is a fact—explain it how we may—that the best thought in law, medicine and theology have been forced upon the professions from the outside rather than evolved from the inside. If the osteopathic colleges are in a measure safe from history's repeating itself in regard to them, it is because they include upon their staffs such considerable numbers of active practitioners. The college faculties probably reflect the best thought of the profession in the cities in which they are situated. This

*Jour. A. O. A., Oct., 1909.

is due to a tendency of the leading and most enterprising physicians to connect themselves with college work. This being the case, the thought of the associated colleges is probably more truly progressive than is the thought of the A. O. A. with the college influence eliminated.

The A. O. A. has probably made a mistake in appearing to regard with some suspicion those who are devoting their lives to teaching and repleting the ranks of the profession. It seems to be an unwritten law in the A. O. A. that teachers in osteopathic colleges shall be excluded from all positions of honor. The only justification for this course is the fear of exciting jealousy among the colleges. Whether this fear is sufficiently well founded to make it wise to exclude from all official positions the men and women who are making the colleges, is an open question. With all respect for the A. O. A. as an organization, the fact still remains that its rank and file is composed and must be composed of practitioners whose minds are so earnestly occupied with the details of their practice that they have little time for serious consideration of the broader and deeper problems relating to the profession, and are thus not so well fitted to pass upon questions of this kind as are those whose college work forces them into consideration of these questions. In other words, I believe that the A. C. O. may justly claim at the present time to be the leaders in professional thought.

Nothing is more natural for the professional man or woman than to remain in substantially the same intellectual condition he was in when he left his college. In his natural and laudable desire to be loyal to the institution which has fitted him for his life work, he is in danger of confining his loyalty to the ideas which were presented when he was a student, rather than to the spirit of the institution.

Members of the A. O. A. must remember that the colleges are each taking steps forward and that their loyalty must be a loyalty to the spirit of progress rather than a loyalty to the special views which were taught when they were students. It is humiliating to the profession to know that their colleges stand upon an insecure foundation. Such, however, is the truth, and one of the first steps which should be taken by the profession at large is to secure the endowment of the colleges. The A. C. O. should find in the committee on education of the A. O. A. a body of wise, clear-sighted men, men of wide experience in legislative affairs, men of long experience in practice, men of thought and originality, whose consultations and suggestions should be of great value in determining the curriculum and the requirements of the colleges.

Lastly, both organizations should recognize the fact that in union there is strength; both should be governed by the wisest and most unselfish, devoted to the common cause; neither should, under any conditions, undertake to exercise snap judgment upon matters of mutual interest; neither should ever resort to the arts of the demagogue in making an appeal to popular sentiment. Great questions never have been, and never can be, settled by majority vote. Strange as it may seem, it is nevertheless true, that a majority is generally wrong. Where the leaders of thought stand today the rank and file will stand tomorrow, but tomorrow the leaders will not be standing where they stand today; they will have advanced to new heights. Any movement worthy to live is an advancing army, with the officers riding far in advance.

The world moves, and it is necessary that educational concepts should move. Those who are not carefully watching the educational trend of matters are in great danger of fearing that progressive changes are leading the colleges away from the osteopathic concept. Let us remember that the osteopathic concept is growing. As has been so often said, the moment we cease to grow, we cease to live. The changes which are made in our osteopathic colleges and in their curriculi from time to time are in the line of progress and development, and are necessary to enable us to adjust ourselves to the growing, developing world.

The osteopathic colleges started as virtually sectarian institutions. By that I mean they stood for one thing, and practically one thing only. They are developing into non-sectarian institutions. That does not mean that they are less loyal to the original idea, but it means that in order to turn out full fledged physicians who are able to meet such emergencies as arise in the daily practice of the physician, it is necessary for the student to be educated in many things in which the earlier practitioners were not educated in their schools, but in which they have been obliged to educate themselves in their offices.

*EDUCATIONAL STANDARDS.

Our drug medical friends are so persistently spreading the report that we are trying to lower educational standards that we feel it only just to give to the world the educational views held by this journal.

We believe most heartily in the proper inspection of school children and in everything that makes for good public and private hygiene. We do not believe that all knowledge of these subjects must necessarily be derived from training received in an allopathic medical college. We believe that the inspection of school children is primarily for the benefit of the children and not for the aggrandizement of any special system of medical practice nor for the financial benefit of physicians who are employed to do the work. We believe that when a person is employed for any kind of public work, the first requirement should be efficiency along the particular line for which he is employed. Specifically, we believe that if an inspector is to be employed for the schools, no inquiry should be raised as to the particular sect of the medical college from which he graduated nor, in fact, should any question be raised as to whether he graduated from any medical college. The only question should be, is this person scientifically and morally fitted to make the examinations which are necessary for the welfare of the child himself and for those who are brought in contact with him?

If this test were applied, it would not hurt us in the slightest degree if every appointment went to allopathic physicians. Should this be the case, it would only mean to us that our own people must bring themselves up to a higher educational standard; but when these appointments are made on the ground that a physician belongs to a special system of practice, we protest both from a professional standpoint and from a standpoint of citizens and taxpayers.

The violent struggle made by the allopathic physicians of Los Angeles for a controlling interest on the school board shows us that a fight which has been largely submerged is now coming to the surface. It is, we believe, a fight which we can easily win if we make ourselves worthy of winning it. To do this, our educational standards must be fully equal to the standards of the allopathic physicians. The result of State Board examinations convinces us that a number of our colleges have already reached this standard. It now remains for them to forge ahead and, as soon as it shall be known that our

*West. Ost., Nov., 1911.

people are as broadly educated as are the drug men, our success is assured. The people at large are sick of drugging. The allopathic physician is being discredited and a goodly inheritance is ours if we can maintain a high educational standard and can honestly seek the good of the public rather than our own immediate interests.

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*THE STATE UNIVERSITY AND THE MEDICAL COLLEGES.

It is authoritatively stated that the State University has formally adopted another medical college. Just what the brand of "medicine" taught by this college may be is a matter of very little moment, but it is a question of far-reaching importance as to whether or not the State should select some special brand of the healing art and give to that special brand the prestige which naturally comes from state patronage. It is quite within the province of the State University to give instruction in anatomy, physiology, bacteriology, histology, pathology, and all other branches which are founded upon definite knowledge, but it is as unwise in the present state of medical science to give instruction in therapeutics as it would be to give instruction in theology. Were either of these subjects presented under the head of "philosophy" or in the department or departments devoted to the so-called "humanities," no just criticism could be offered; but when the State definitely teaches that some particular system of therapeutics is correct and that the use of certain drugs is necessary for the alleviation of suffering, a great wrong is inflicted upon other systems of therapeutics which perhaps rest upon an equally solid foundation.

Never in the history of medicine has there been a wider range of honest opinion than there is at the present time, and it is needless to say that this great variation of opinion indicates the uncertainty of all of our systems. Not only is the whole science of medicine undergoing rapid changes, but every individual system is in a chaotic state. To sieze upon one of these systems and undertake to crystallize it is, of course, to arrest its own power of development, and this system is in danger of becoming a conscious or unconscious persecutor of other systems. All broad-minded thinkers are agreed that few things are more detrimental to religious development than a state church, and all of the

*West. Ost., July, 1909.

evils which can be pointed out in regard to a state church apply with equal force to state medicine. When therapeutics shall become an exact science, then, and only then, will it be safe for a State university to conduct a medical college. If we had some system of theology which could be demonstrated with absolute scientific exactness, it assuredly would not only be proper, but highly desirable, that this system should be taught at public expense; but, recognizing as we do the utter lack of scientific foundation for our theological systems, we wisely exclude that subject from our public school curriculum, and, as I above stated, the reasons for the exclusion of therapeutics are quite as valid.

The *Southern California Practitioner* for August, 1913, contains a letter from Dr. F. E. Moore of Portland, Oregon, in which Dr. Moore tells of the necessity of the Osteopathic physician concealing his system of practice if he desires to enjoy the advantages offered by European hospitals, and then the *Practitioner* inquires: "How would you like to be a D. O.?"

In answer to this question of our contemporary, we will say that we are very glad to be D. O.s. That even if we had no better system of practice than have our drug friends, we would still rather be D. O.s, and suffer the limitations which the American Medical Association in Europe inflicts upon us, than to be the bigots who inflict this inconvenience. If we read the history of the world aright, bigotry never has accomplished its purpose, and if our M.D. friends suppose that they can seriously injure Osteopathy by petty persecutions, we simply desire to tell them that they are mistaken. John Calvin succeeded in burning John Huss at the stake, but no intelligent person would now think of undertaking to defend the views of John Calvin, while the views of John Huss have gone far toward changing Europe from barbarism to civilization.

Whatever our drug friends have in the art of healing diseases that is true, will live, and they need not persecute others to make it live. On the other hand, whatever they have which is fallacious will die in spite of all that they can do to prolong its life.

Whatever may be true in Osteopathy will live in spite of all our drug friends can do. Whatever is untrue will die of its own weight, and the sooner the better for all of us.

THE INDEPENDENT COLLEGE VS. THE UNIVERSITY COLLEGE

The man or woman who has decided to become a physician finds a problem which is at once of the greatest importance and the greatest difficulty. There are so many colleges offering valuable courses that the wise selection of one of them requires much study. Many of our leading universities maintain medical colleges, and at first thought one might conclude that these would offer advantages which are superior to those offered by colleges not thus supported. For a certain class of medical education this is probable true; for another class it is certainly not true. The student who desires to fit himself to act as health officer in the larger cities, as quarantine inspector at seaports, or as sanitary engineer to grapple with the larger problems of preventive medicine, will find splendid opportunities in the medical colleges associated with the great universities; to the student who wishes to fit himself for the work of a physician, for the care of the sick and the personal supervision of the health problems of the family and the community, the smaller colleges offer surpassing advantages.

In the smaller colleges, the teachers are, for the most part, themselves professional men and women. They are constantly meeting the problems presented by the emergencies of the sickroom and the idiosyncrasies of the people in it; of the health office, of the sanitary laws, and of the need for watchfulness for beginning epidemics. Students who come into intimate, daily association with teachers who successfully meet these problems must receive the best possible preparation for dealing with such conditions in their own practice after graduation.

On the other hand, this close personal association compels constantly higher ideals on the part of the teachers. Students who know their teachers intimately demand the highest scholarship, the purest professional ideals, and the strongest and finest personal characteristics. While the strictly technical training of the teachers in the great universities may be unexcelled, the teachers in the smaller colleges have usually the greater power of developing the broad intelligence, the immediate efficiency, and the practical common sense which are of first importance in meeting the requirements of professional success.

*DEGREES.

As the osteopathic profession has been agitated over the question of degrees for the last two years, it has occurred to me that a brief history of degrees might not be without interest.

The ancestral form of the modern degree had its inception in a desire to preserve the purity of theological teaching, and no one was allowed to call himself a master or doctor (both of which terms originally meant teacher), until his qualifications had been passed upon by a bishop or the chancellor of a cathedral. The possession of either of these titles, duly attested by a bishop or the head priest of a cathedral, was regarded as evidence of the purity of the teacher's theology and a guarantee that he would not seriously mislead those coming under his instruction. As cathedrals and monasteries became centers of theological instruction as well as places of devotion, young men were drawn to them for educational purposes and the beginning of organization was not among those giving instruction, but among the students themselves, and it appears to have been for the purpose of guarding themselves against the extortions to which strangers were commonly subjected in medieval cities. As these student guilds became larger and more thoroughly organized they not unnaturally attracted public attention, and it very soon became a settled policy that degrees should be granted to their members only on authority bestowed by the Pope, some emperor or king.

By the year 500 A.D., the old Roman schools were for the most part dead and universities were springing up around the cathedrals and monasteries. The first division of educational subjects was made for the purpose of differentiating the instruction given the priests from the instruction given the monks. Gradually the instruction became more secular in character and by the year 900 A.D., this division of subjects had proceeded to such an extent that in several seats of learning four faculties were recognized. These were the faculties of theology, the arts, medicine, and the law.

The first medical faculty known to have been organized was that of Salerno, Italy. It is perhaps not digressing too much to say that Salerno owes her precocity largely to the influence of Saracen physicians, who settled in Southern Europe at an early day. Up to this time degrees were granted to those who showed special aptitude

*Jour. A. O. A., April, 1911.

for teaching, and simply meant that the possessor had the authority of his university to give instruction. Up to the thirteenth century, no clear distinction was recognized between the master and the doctor, but about that time the degree of doctor came to have a higher significance than that of master. The term doctor, as used until about 1500, was generally followed by an adjective giving some characteristic of its possessor, such as *profundus* (learned), *angelicus* (angelic), and others. At this time, that is at the beginning of the sixteenth century, the school in arts or philosophy extended through four years of time. The course in law extended through seven years of time; the course of medicine through eight years, and the course in theology through fourteen years. This seems to us at first to have been time for rather extensive instruction, but when we remember that students did not, as a general thing, possess the art of reading when their instruction began, and that they were for the most part a self-supporting body during the time they were receiving instruction, we need not suppose that their knowledge was any too profound at the time of their graduation.

It was not until some time in the seventeenth century that our modern college degrees came into general use. If the term "Bachelor" was used at all in the earlier institutions of learning, it simply designated a student, but with the rise of the universities of England to secular educational institutions, rather than monastic institutions, our modern degrees came to have well-defined meanings. In the department of arts or philosophy, he who completed the prescribed course, was given the degree of Bachelor of Arts. He who pursued the subject somewhat more extensively, was admitted to the degree of Master of Arts, and he who by diligence fitted himself to give instruction, received the highest academic title, that of Doctor of Arts or Philosophy. Our more modern academic degrees of Doctor of Science, Doctor of Music, or Doctor of Zoology, etc., appear to have originated within the last 150 years. I have not been able to find evidence that the degree Doctor of Medicine was used in the modern sense of the term until about the year 1350. From that time on it seems to have been granted more or less frequently by the faculties of medicine in European universities, and before the Pilgrims landed on Plymouth Rock it was the badge of the professional physician.

As the early European universities were entirely separate from each other, and as there was little tendency for professors to pass from one to another, it naturally followed that their teachings were extremely inharmonious, and physicians educated at one school had very different ideas in regard to the nature and cause of disease from those educated in some rival school.

It was not, however, until some time in the eighteenth century that any special animosity existed among the different schools, and it was not until late in that century that it appears that anyone attempted to secure laws antagonistic to those holding opinions inharmonious with his own. In Hungary and Spain, medical teachings seem to have been specially sane, and the osteopath who reads the views of many of the Spanish and Hungarian physicians cannot fail to see in their philosophy views singularly in harmony with his own. As has been before stated, all these physicians, notwithstanding the extreme diversity of their views, were designated by a similar title or degree. In fact the osteopaths are the first division of the medical profession who have deemed it wise to distinguish themselves by a special title.

If it is true that the Allopathic physician is intellectually a descendant of German and English physicians distinguished by the title of Doctor of Medicine, it is also true that the osteopath is the intellectual descendant of the Spanish and Hungarian physicians who had the same degree. There are still some osteopathic physicians who appear to believe that the system of therapeutics which one follows is in some way dependent upon the special degree which he holds. It is, of course, needless to say that this not true. Degrees have very largely lost their importance in modern education. Some of the ablest university professors have, for reasons satisfactory to themselves, never cared to take more than the Bachelor degree, while they have signed diplomas conferring the degree of Doctor upon numerous students. Forty years ago there was a decided tendency to increase the number of degrees, and every little college at the cross roads was devising and granting new degrees to its graduates. At the present time the tendency of all the more dignified institutions is to decrease the number of degrees. The degree Bachelor of Science is likely to be eventually discarded for the older degree of Bachelor of Arts. This does not mean, however, that the instruction formerly given to attain the B. S. degree has been dropped, nor does it mean that science will be less cultivated by the B. A. than it was by the B. S.

It may be that we as a profession shall continue to deem it best to hold our extremely protestant position and continue our special degree with all of the advantages and disadvantages accruing therefrom, or it may be that we shall eventually find it best to use the degree which has so long stood for the medical practitioner. In neither case will it mean the slightest surrender of our special system of therapeutics. The medical doctor of Hungary depended upon mechanical stimulation, exercise and diet, just as honestly as the medical doctor of Germany and England depended upon the powder of crushed toads and the decoction of ill-tasting plants.

Degrees are a kind of relic of the Middle Ages which have lived down to the present time and that they are becoming as much of an anomaly in our modern educational system as a pterodactyl would be were that beast to appear in a modern zoological garden. The modern student who is worth anything works for knowledge rather than for the privilege of appending letters to his name. Then, too, we believe that the idea of requiring a long period of training to attain to the dignity of his higher degrees are wrong from a psychological standpoint. It seems that the human mind is so constituted that it cannot spend long years in learning what other people think and still preserve very much power for original thought. It is a well-known fact that many of the truly great men and women of the world have been absolutely without college training and many of the great thinkers who have been college bred were not regarded with high favor by the institutions from which they graduated. All of this strengthens our conviction that long-extended courses of study educate all of the originality out of the student. At the end of these long courses he may know wonderfully well what others have thought, but he is ill prepared to do very much thinking for himself.

There is always danger that when a speculative subject is supported by the general Government it will crystallize into hard and fast dogmas. When this occurs, it not only prevents the progress which every science should make, but it becomes more or less of an oppressor of other systems of thought. Neither a State religion, a State medicine, nor a State sociology is at all compatible with the progress which a free people must continue to make.

*STATE BUREAU OF HEALTH.

A statement is being widely circulated through the State that an effort will be made this winter to secure a law providing for a State Bureau of Health.

On its face, a law of this kind seems most beneficent, as under its provisions physicians would be appointed to examine children in the public schools, and to advise or even compel parents to secure such treatment for them as their condition would indicate to be most beneficial. The State Bureau of Health would also have general supervision of all sanitary matters in the State, and would largely do away with the need of much of the personal care and attention now given by individuals to health problems.

We say that on its face all of this seems beneficent, but when we look below the surface there are at least two objections which manifest themselves. The first is that too great paternalism on the part of the Government always results in the degradation of the people. If people were protected from the folly which they might learn to avoid by experience, the world would soon be filled with fools. Good hygiene, both public and private, is of immense value, but if it is purchased at the expense of individual exertion and individual development, valuable as it is, we have purchased it at too high a price.

The second objection is that we are in serious danger of committing to the central government those duties which should be performed by the local government. From a financial standpoint, centralization is unquestionably beneficial, but he who sells liberty for money makes a poor exchange. The tendency of all of this is to establish a State school of medicine, and should this be done it would practically put an end to medical progress so long as such a law remained in force. We want no State medicine and no State religion. We have no thought that a State-directed system could long be permanent among liberty-loving people, but it will be vastly more to our credit to refuse to allow such a system to be organized, than to permit the shackles to be placed upon us, and afterward free ourselves from them. We believe most strongly in public hygiene and in private hygiene, but we believe in the administration of public hygiene by the local government rather than by the State.

We cannot be unmindful of the fact that the United States Marine

*Ed., West. Ost., Jan., 1911.

Service represented California as being in very much greater danger of bubonic plague than she really was. It is an extremely difficult matter to get at the real truth of the situation, but it is only fair to say that there are some very well-informed people who seriously question there having been one case of bubonic plague in California, and no one can be a very profound bacteriologist without knowing that there are bacilli corresponding so closely to the organism which produces bubonic plague as to make the distinction between the two extremely difficult.

No matter how beneficent a system may be in its incipiency, it becomes dangerous when it is fully organized, and we believe that the real interests of the public and the honest advancement of the science of medicine are both largely dependent upon local control of public hygiene rather than to allow this important matter to be organized into a State system.

If there is one subject above another which is chaotic at the present time it is that of therapeutics, and for us to voluntarily limit our development along that line seems to me to be a mistake for which we will have little excuse to offer in the future. I am heartily in sympathy with those who believe that the use of drugs is an error, and a most serious one, too. There are, however, a number of therapeutic measures which possess more or less value, and these are the heritage of the medical profession. They belong to the drug system of practice no more than to osteopathy, or to any rational system which may be developed in the future, because they are in harmony with the laws governing cell life. In this class belong all measures of public and personal hygiene, asepsis and antisepsis and the use of anesthetics under certain conditions.

In saying this I do not mean to encourage the idea of making osteopathy a hodge-podge. It seems to me that we should use whatever therapeutics we find necessary to give every cell in the body, as well as the body itself, a normal environment. This must include also the means necessary for the removal of foreign substances or abnormal tissues which interfere with the proper working of the body.

HYSTERICAL FEAR OF PARALYSIS

We have recently been treated to a somewhat hysterical alarm of infantile paralysis in California. We do not seriously question there having been a number of cases in Los Angeles, and probably in other cities, but we do not believe that every case which has been diagnosed as infantile paralysis has been a case of that dread disease.

Intentionally or unintentionally, a number of physicians have worked up a needless and senseless hysteria on this subject. These hysterical fears should be frowned upon by all intelligent people. It is by no means easy to estimate the harm which comes from things of this kind. In their senseless fears, people are led to do the very things which most predispose them to the disease which they are seeking to avoid.

We are heartily in sympathy with regulations which shut children out of theaters and other crowded and more or less imperfectly ventilated rooms, but we believe it a great mistake to shut them out of parks and places of recreation, where they are in the sunshine and fresh air. We are especially opposed to arousing a fear on the part of the public, which is so easily commercialized by the profession which originates it.

We have not yet passed that stage of mental development where there is a feeling in the minds of many people that diseases are "sent" in some mysterious way. Even the responsibility for accident is often condoned by the assurance that the seeming misfortune was "sent" for some ultimate good.

If there is any lesson which we need to learn more than another it is that we live in a world of cause and effect; that from a standpoint of health, at any rate, there is no such thing as vicarious atonement; that disease comes as the result of a violation of the laws of our beings, and that disease can only be prevented by a thorough understanding of the causes of disease and an intelligent avoidance of those things which produce it.

NOTES.

Young people now entering mature life must recognize the fact that the work of the modern physician is, and must be, quite different from the work of the physician in the past. Until recently it was supposed that sickness and disease were inevitable. Now we are finding that the greater part of sickness is entirely unnecessary and that, with proper public and personal hygiene, it may be avoided. Hospitals must be maintained not for the benefit of a staff of physicians but because they minister to public needs and if the free dispensary answers a real public need, it will exist no matter how detrimental to physicians it may be and physicians must simply learn to accommodate themselves to these new conditions.

A little while before the opening of each term some, and perhaps all, of our osteopathic colleges receive letters from practitioners scattered over the country saying that they have prospective students whom they can influence as to the college which they shall attend and asking for "bids" for these students. It is needless to say that no self-respecting educational institution can or will make a bid on any such proposition. No college should receive a student until there is some reason for believing that he may successfully complete the course. To do otherwise is to commercialize college work beyond all endurance. The colleges must necessarily depend upon practitioners in the field for finding suitable students for them, but the most that the practitioner should do is to notify the college of the prospective student and tell the prospective student of the college so that they may get into mutual correspondence.

The time has come when we have got to consider very carefully the qualifications of those who are to enter the Osteopathic profession. Schools are not, and cannot be, money-making institutions. All educational institutions are money consumers and the day is not far distant when our colleges will have to be at least partially supported either by their alumni or by special endowment. When a practitioner finds a person who would be likely to be of value to the profession he should be patriotic enough to help to get him into the best college with which he is acquainted and this should be done without thought of private gain.

*FEE-SPLITTING.

One of the most dangerous and insidious of the faults of our drug medical brethren has been imitated to some extent by physicians of our system of practice. We refer to the acceptance of commissions which are offered by surgeons and other specialists.

The more conscientious of the drug medical journals are crying out against this evil, and we believe that our own branch of the profession should draw back ere their hands become seriously contaminated by these base bribes. Unfortunately we have not a copy of medical ethics at hand, but we fearlessly assert that true ethics requires that the physician have no transactions with the specialist with which the patient is not fully cognizant. With human nature as it is, it is utterly useless to talk of a person's possessing perfectly unbiased judgment when there is a rich bribe ready for him if he shall decide in a certain way. Unconsciously to himself, the prospective commission induces the physician to advise operations from which he otherwise might strive to save his patient.

Like most other ills, this method of doing business is something of a boomerang to the physician employing it, for the surgeon, well knowing that he will be obliged to divide his fee, charges much more than he otherwise would, and in that way the patient, consciously or unconsciously, aggrandizes the surgeon to whom he pays the big fee at the expense of his physician to whom he has been in the habit of paying much less.

As we see it, the physician is entitled to compensation for whatever services he renders his patient; he is entitled to compensation for the examination which indicates the necessity of surgical or other special treatment; for such assistance as he renders the surgeon at the time of the operation; and for the after care of the patient; but we believe the dignity of the physician should forbid his acting as a mere procurer for the surgeon. In other words, let the surgeon have his pay for services rendered, and let the physician have pay for services rendered, and let the relationship be such that the patient may know everything connected with the business. We fully believe that the physician is treading on very dangerous ground when he engages in any kind of a transaction which will not bear the light of publicity.

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*West. Ost., April, 1911.

*EARLIER RESEARCH WORK.

It may not be without interest when the air is full, as it now is, of research work to say a few words about the earlier attempts in this direction. It is quite possible that some work, of which I have no knowledge, was done in the early days.

The first real work, so far as I know, was done by Dr. D. L. Tasker at the Pacific College of Osteopathy. This work was reported in the *Osteopath,* a journal then published by the College. His report appeared in the August number of 1901. The title of the article was "Pulse Tracings," and it was illustrated by three engravings showing the effect upon circulation of stimulation of the vagus nerve. Dr. Tasker concluded his description of these experiments by the statement: "The character of the pulse shows a wonderful influence has been exerted on the heart."

The next recorded work which I have been able to find was done in the year 1905. In this year three valuable papers appeared. One was a partial report of experiments upon visceral reflexes. This paper was by Dr. Louisa Burns and was published in the *"Osteopathic World,"* of Minneapolis, in August, 1905. This report, although brief, was indicative of the great amount of work which Dr. Burns was doing at that time. Her conclusions were founded upon experiments made upon about thirty cats and dogs. Among the conclusions reached were these:

"Mechanical stimulation in the lower dorsal region initiates peristalsis and vaso-constriction in the stomach and intestines, while deep, steady pressure in the same region relaxes the muscles both of the stomach and intestines and their blood vessels."

"Stimulation of the pneumogastric nerve initiates vaso-constriction and peristalsis in stomach and small intestines."

"Gentle stimulation applied directly to the walls of the stomach and intestines produces normal peristalsis under normal conditions."

"After section of the splanchnic nerves gentle stimulation of the walls of the stomach or intestines almost immediately produces the most violent peristalsis."

"After section of the pneumogastric stimulation directly applied to these structures was followed, after a perceptible latent period, by

*Jour. A. O. A., June, 1911.

the inhibition of any peristalsis already present, then by reversed peristalsis. Bile was sometimes found in the stomach after this experiment."

The same year that this report appeared Dr. J. J. Pierce, then of San Francisco, read a paper before the meeting of the California State Association on some visceral actions obtained by manipulation of the cerebro-spinal nerves. This paper was founded upon a series of careful experiments carried out by Dr. Pierce. His own statement is, "I have used various small animals—rabbits, cats and dogs—but mostly rabbits on account of the ease of handling. The operations are painless, the animals being anesthetized beforehand." Dr. Pierce especially emphasized the importance of his experiments from a practical standpoint. The value of these experiments as they appeal to him were as follows: First, "Confidence that one may obtain definite action over certain nerves and centers by manual means; second, knowledge of the effect upon visceral action of irritative, destructive or inhibitive lesions upon the course of such nerves or centers as control the organ in question; third, a means of effectively demonstrating that osteopathic processes are scientific and can be proven."

As before stated, Dr. Pierce's paper was presented before the State Association of California. The National Association that year was held in Denver and at this meeting Dr. Carl McConnell delivered a stereopticon lecture illustrative of the original work which he was doing. It is probable that Dr. McConnell's photographs were the first ever made showing the effect of bony lesions upon the organs of the body. I regret that I cannot, at the present moment, place my hand on Dr. McConnell's report, but I well remember that those of us who listened to his masterly report felt that osteopathic principles were so thoroughly demonstrated by his work that we are not likely to lose faith at any time in the future. 1905 was certainly a great year for us.

The next matter of original research was on the question, "Which weighs the most, the egg or the chicken which comes from the egg?" The experimentation in this case was carried on by Dr. John O. Hunt, then a student in the Pacific College, and myself. The result was published in the bulletin of the Southern California Academy of Sciences in December, 1906. As a result of these experiments it was found that a sterile egg kept in the incubator by the side of a fertile egg lost 15½% of its weight. The chick hatched from the fertile egg weighed 29.65% less than the egg at the time of the beginning of incubation. In a second experiment the unfertilized egg lost 17% of its weight, while in an egg from which a chicken developed the loss was 20% of the original weight.

Since 1906 research work has been vigorously prosecuted. It is highly probable that previous to that time considerable research work had been done, but I have not found it reported in the periodicals to which I have had access.

From its earliest days the Pacific College has emphasized the importance of the laboratory side of the physician's education. This has been true to such an extent that it may be truthfully said that the history of the scientific development of this college is the history of the scientific development of osteopathy. Few of the osteopaths of the present day are aware of the small value which the early osteopaths placed upon scientific training. The truth is that at one time it was necessary to explain and almost apologize for work of which we are all proud today.

It is probable that the rank and file of the profession are very much more interested in the application of the fundamental principles upon which osteopathy rests than in the development and discovering of these principles. This of course is perfectly natural, but the thoughtful members of the profession must ever keep in mind the fact that our advancement is entirely dependent upon the solidity of our fundamental principles. Give each one of us a thorough knowledge of the human body and the professional side of the work will largely take care of itself.

It seems to us it would be better if the members of the profession should always use the term Osteopathy as meaning a philosophy rather than as the name of a special kind of manipulation. As a philosophy Osteopathy includes all methods that can be used to surround a person with proper environment, internally and externally, so that the functioning of the body may be restored from an abnormal condition to a normal condition and in that way the patient helped from a condition of sickness into a condition of health.

PART IV.
Articles of General Interest

*THE THERMOMETER.

Among the many instruments of precision which the modern physician uses in his routine practice, none is of more practical value than the thermometer, and perhaps among them all there is no instrument of whose history the ordinary practitioner knows less. This is not at all unnatural when we consider the fact that the generation which first knew of the thermometer were gray headed and decrepit with age when the Pilgrims landed on Plymouth Rock.

The first thermometer, so far as we know, was invented about 1575. This thermometer was what is now known as an air thermometer, and consisted of a glass bulb with a long, tubular stem. When the bulb was warmed so as to expel some of the air and the open end of the stem placed beneath the surface of water, the water was forced up the stem as the bulb cooled; and if the room became warmer, the expansion of air in the bulb would force the water in the stem downward; and if it became colder, the contraction of air in the bulb would permit the water in the stem to be forced somewhat higher by atmospheric pressure.

It will readily be seen that by means of this somewhat crude instrument it would be possible to determine the relative temperature of rooms; and by marking the place where the water stood in the stem at a given time, it would be possible to determine whether the room was growing warmer or colder. This instrument was invented by a Hollander by the name of Drebbel.

It was only a few years later that some one, it is not now known who, invented a thermometer the form of which closely resembled our modern instrument, using alcohol as the expanding substance. By means of this thermometer it was possible to compare the temperature of one person with another. It is probable that the physicians connected with the medical college in Florence, Italy, were the first to use the thermometer as a clinical instrument. While we have no definite information as to just the time that this was done, we are probably safe in fixing the year 1600 as not far from the proper date.

*West. Ost., April, 1911.

One hundred years after this, physicists were earnestly working on the problem of a proper scale for the thermometer. About 1714, Daniel Gabriel Fahrenheit, another Hollander, produced a thermometer in which mercury took the place of alcohol, and, so far as we know, he was the first one to use zero on a thermometer scale. His zero point was fixed at what he regarded the lowest attainable temperature. This was the temperature produced by mixing ammonium chloride and ice. He arbitrarily fixed the temperature of the human body at 100 degrees, and divided the space between his zero and the temperature of the body into one hundred equal parts. Two hundred and twelve of these parts is the temperature of boiling water, and thirty-two of these parts is the temperature at which water freezes. More careful observation of the Fahrenheit scale has shown that he was about one and one-half degrees wrong in regard to the temperature of the body, and consequently his whole scale becomes purely arbitrary.

In 1730 Reaumer gave his scale to the world. He fixed the freezing point of water at the zero point and its boiling point as one hundred degrees. For some reason, not now known, he afterward changed the boiling point of water to eighty degrees.

In 1742 Andrew Celsius reintroduced the scale formerly proposed by Reaumer, with the exception that he reversed it, calling the freezing point of water one hundred and its boiling point zero.

About twenty-five years after this, this scale was reversed by the Swedish botanist, Carl Linnaeus. It is this scale which is still used in the Centigrade thermometer. Centigrade thermometer, and the metric system of weights and measures are much more philosophical than the Fahrenheit thermometer and the common English system of weights and measures, but such is the vein of conservatism running through our natures that in spite of their utter lack of philosophy, both of these systems are still in use and will perhaps remain in use for some time to come. It is probably needless to call the attention of physicians to the fact that unless a scale of correction is furnished with a thermometer, every new one should be carefully compared with a standard thermometer. This is owing to the impossibility of making an instrument absolutely correct from a mechanical standpoint.

*THE UNITED STATES PHARMACOPOEIA.

There are comparatively few books which more intimately concern the medical profession than does the United States Pharmacopoeia, and yet comparatively few physicians seem to have other than the most shadowy and vague ideas about this work.

The word "pharmacopoeia" is of Greek origin, and it means "to make medicine." The object of the work is to insure the standardization of preparations used in medicine. For instance, the liquid we buy under the name of spirits of camphor consists of camphor gum dissolved in alcohol; but as camphor gum is freely soluble in alcohol, one will readily see that, if the spirits of camphor is always to be of the same strength, a definite amount of the gum must be added to a definite amount of alcohol; and as alcohol somewhat diluted with water will also dissolve camphor gum, if the preparations are to be uniform, the alcohol used must always be of a given strength. It is to insure such uniformity as has been suggested that the Pharmacopoeia exists.

The first American Pharmacopoeia was issued in 1820, and since then a new edition has appeared during each decade. The entire set of Pharmacopoeias furnish much food for thought to the student of the history of medicine. Each one as it has appeared has faithfully reflected the medicines which at that time were regarded as efficient for the treatment of disease. Very few medicines have stood the test of time. With each new edition of the work, some have been dropped and new ones have been added. The mere fact that a given preparation appears in a Pharmacopoeia is no reason for assuming that it has real therapeutic value. It merely means that a considerable number of physicians have been in the habit of using it and perhaps believe that it is valuable; but that this belief is often transient is shown by the facts which I have just cited.

By way of illustration, let me say that witch hazel at the present time is highly valued by many physicians as well as by the laity. It is, however, about as inert as anything can be. Nevertheless, because it is in demand, it has a place in the Pharmacopoeia. If any considerable number of physicians should come to believe that sea sand is valuable for the treatment of disease, it would at once be admitted to the Pharmacopoeia, and the standard of its purity and method of preparation would be established by that work.

*West. Ost., Feb., 1910.

It is one of the peculiarities of Anglo-Saxon civilization to allow matters of great public importance to be undertaken by individuals. While the Pharmacopoeia has no legal standing, it is nevertheless the acknowledged standard used by the United States Government in determining cases relating to the pure food law. In somewhat the same way, a semi-religious organization known as the Brethern of the Trinity control the entire lighthouse system of England.

In the early days of the Pharmacopoeia, the work was entirely done by physicians, but between 1850 and 1860 the science of pharmacy underwent rapid development, and since that time pharmacists have taken a more or less active part in the production of the Pharmocopoeia, and at the present time physicians have little to say in regard to what shall or shall not appear on its pages.

Those who use drugs in the treatment of disease are feeling more and more keenly the serious need of an international pharmacopoeia. For instance, arsenical preparations which are used in medicine vary from arsenic 1 in 10,000 to arsenic 2 in 100, in western European countries, so that the physician who should write a prescription containing arsenic as he would write it in his own country might easily prescribe a fatal dose to a patient living in another country. As Canadian standards are widely different from our standards, it is easy to see that, owing to physicians freely crossing the line, serious mistakes might easily occur.

While we are developing a drugless system of therapeutics, the fact still remains that there are lotions and preparations of many kinds which every physician must use, and the great source of information in regard to all of these is to be found in the American Pharmacopoeia, a new edition of which will very soon be placed upon the market.

During the past month a considerable number of milk examinations have been made in the pathological laboratory of the college. In a surprising number of cases the nutrient content of the milk has been found surprisingly low and in every case where a better quality of milk has been furnished infants they have made the most striking improvement. It certainly appears that the physician is not justified in treating a babe that is not doing well without having a careful analysis made of the milk which the child is using. Frequently the only attention which the child needs is an improvement in its diet.

*MEDICINES AND THEIR EFFECTS.

No intelligent person who has had very much experience with the sick will deny the fact that medicines sometimes appear to accomplish very desirable results. If this is so, why not use them? It is certainly not enough to tell the intelligent practitioner of today that he must not use a given method of treatment with his patients because it is "not osteopathic." Common humanity would compel him to use things that are good even if his loyalty to a system of practice might otherwise have prevented his doing so. If the osteopathic physician of today is to condemn the use of medicine, his condemnation to have any weight either with his fellow practitioners or with the public must rest upon a scientific basis. A belief that such a basis exists, that it is genuine and that it is sustained by the results of the most rigid investigations is my personal reason for objecting to the use of drugs.

A short journey into the field of general biology is required to show the validity of this position. All of the cells which enter into the structure of the more complex organisms can be divided into two groups: the first group comprising those which form the body of the individual; the second group is made up of the reproductive cells.

The reproductive cells differ from the cells composing the body in that under favorable conditions, they may unite with other reproductive cells and by so doing, acquire a capacity for reproduction which they did not previously possess. All cells at some period of their lives possess the power of reproduction but those cells which are incapable of conjugation (or uniting with other cells) possess only a limited power of reproduction; for instance, the nerve cells found in the human brain have exhausted their power of reproduction long before the infant is born, and however long he may live, it appears to be impossible to increase the number of nerve cells.

The connective tissue cells and the muscle cells possess a greater power of reproduction than do the nerve cells. Under ordinary conditions this reproductive power lasts long enough to supply the needs of the human being during an ordinary lifetime. The epithelial cells which cover the surface of the body possess such an enormous capacity for reproduction, that their power is seldom exhausted during life, though it is possible that some cases of senile gangrene may be due

*Address, Round Table on Children's Diseases, Chicago meeting Am. Ost. Ass'n, 1911. Pub. Jour. A. O. A., Sept., 1911.

to the epithelial cells having exhausted their power of reproduction. The epithelial cells of the glands have far less reproductive power than have the epithelial cells found upon the surface of the body. Their reproductive power is sufficient for an ordinary lifetime only when excessive demands are not made upon them.

As an illustration, that seems fairly good for the cells of the body, I would suggest that one should think of an infant at whose birth some person should deposit $1,000 for each year that the child may live. We will assume that the child may live seventy-five years and that $75,000 is deposited with the understanding that $1,000 may be used each year for its support. If the child should assume charge of himself, he might by experimentation find that a check for $2,000, $5,000 or even $10,000 is honored quite as readily by the bank as a check for $1,000, nevertheless, we can readily see that if he draws any considerable number of these large checks, the time will inevitably come when his money will be quite exhausted. So it appears to be with the epithelial cells of the glands of the body when their reproductive powers have been exhausted or destroyed by the use of drugs.

Of these glands we have more practical knowledge of the kidneys and of the liver than any of the others. Careful investigations that have been made by competent pathologists, show that almost all drugs are destructive to the epithelial cells of the kidneys. Prof. Pearce, of the medical college of the New York university, states that this is true of salts of all metals. To this he adds coal tar products, alcohol, oxalates, essential oils, immune serum and a number of other substances, some of whioh are not commonly used by physicians.

Now if this is true and it certainly appears to be, it means that the medicines which are given to the child and which may appear to have a reasonably good effect, really make an excessive demand upon the reproductive power of the kidney cells and if they are used to any great extent, the reproductive power of the kidney is exhausted comparatively early in life and so the patient comes to be the victim of nephritis. This is in strict harmony with common observation.

The physician who has a practice of any extent, cannot fail to note the large number of middle-aged people who come to him suffering from nephritis and in many cases the cause of the disease is not easy of explanation, but when we remember how universal drugging is and when we remember that salts of all metals, sodium chloride, (common salt) not excepted, are more or less destructive to the kidneys, causing the rapid destruction and multiplication of kidney epithelium, and when we remember that the number of times any given cell can divide is limited, it then becomes easy for us to understand why it is the kidney gives out long before the other parts of the body have lost their vigor.

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*ICHTHYOL.

Ichthyol is the trade name of a dark brown antiseptic substance which is about as thick as tar.

Ichthyol is obtained in the Austrian Tyrol by distilling an albuminous shale in which there are large numbers of fossil fish and other forms of sea life. The name of the substance was undoubtedly suggested by the remains of the fish present in this shale, as the word Ichthyol really means "fish oil." The shale is heated in huge receivers tc a temperature of somewhat more than 200 degrees centigrade, and at this temperature the volatile oils are driven off and condensed. These oils are treated with sulphuric acid and the ichthyol of commerce is the ammonium salt of this acid preparation.

As before stated, ichthyol is a strong antiseptic and like most other antiseptics, it is a poison. It should not be used in full strength upon a mucous surface. It may be diluted with either water, alcohol or glycerine. A favorite preparation is made by adding one part of the ichthyol to from ten to eighteen parts of glycerine. Used in this strength it is still strongly antiseptic, but there is little danger of enough being absorbed from this preparation to injure the patient.

Ichthyol is used by many physicians as a vaginal and uterine wash under the impression that it "heals." This is far from being the case. The only good which can come from it is from its antiseptic properties, and if a raw or denuded surface is kept free from bacterial infection, nature will soon attend to the healing, and all that Ichthyol or any other preparation can do is to get the tissues in such condition that the healing forces of nature can act.

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*West. Ost., Nov., 1913.

*MEDICINES THAT ARE "HARMLESS."

In these days when large numbers of people are striving to live without being producers we need not be particularly surprised to find many who are striving to get a living by the sweat of other men's brows by manufacturing and selling what are commonly called "harmless medicines."

The osteopaths are at the present time being earnestly canvassed by agents for several of these so-called "harmless" preparations. So far as any special effect upon the human body is concerned, we suspect that many of these preparations are practically inert and when the agent tells us that they are harmless we presume that he tells the truth so far as their direct effect upon the body is concerned, but their harmfulness is very direct, because they so often prevent the physician from doing the real thing which may be of service to his patient. While the physician is administering these entirely unknown and inert remedies, valuable time which ought to be devoted to doing something that would count is being lost.

We certainly have no ill feeling toward the man who has given careful attention to drugs and drug medication who uses drugs in his system of therapeutics. We are very honest in believing that he is mistaken in regard to the best means of treating disease, but we are willing to believe that he is conscientious and that he is doing the best that he knows. We are wholly unable to take the same charitable view of drug-dabbling osteopaths. Our colleges are not teaching drug medication, and the osteopath who uses drugs does so fully conscious of the fact that he has had no training or preparation which warrants his using them or which will sufficiently guide him to prevent his doing his patient serious and possible irreparable injury. If drug medication is the best treatment for sick people, our colleges are certainly on the wrong road. If, on the other hand, the therapeutics which they are teaching represent the best system, our people make a great mistake in wasting their time and the time of their patients with drugs which are ignorantly administered. As far as our observation goes, we feel quite certain that the most successful osteopathic physicians are those who adhere most strictly to the system of non-drug therapy and we feel very certain that so far as they educate themselves sufficiently and so far as they let drugs alone, they will in every case be successful when brought into competition with the drug-giving doctors.

*Ed., West. Ost., May, 1911.

*ADDICTION TO DRUG HABITS.

Dr. Lyman F. Kebler, chief of the drug division of the United States Department of Agriculture, has recently made some very interesting investigations in regard to the use of habit-forming drugs in the United States.

By the term "habit-forming drugs" is meant opium, morphine and their derivatives, cocaine, codeine, acetanilide, antipyrine, chloral hydrate and a few other drugs more or less related to these. Dr. Kebler points out that notwithstanding adverse legislation by states and cities, the use of these drugs is constantly on the increase. The use of opium and opium derivatives has more than doubled per capita during the last forty years, and this in spite of the fact that we have other drugs of similar properties and also extensive use. Cocaine has been in use about twenty-five years. Its use is now so enormously increased that about 150,000 ounces are required each year to supply the demand. Dr. Kebler states that this is at least ten times as much as is needed for the legitimate uses of this drug. Each year we import about 500,000 pounds of opium. With the rise of cocaine the use of opium has somewhat decreased of late, the importation last year being about 20,000 pounds less than the previous year.

In many foreign countries, such as Germany, Holland, Italy and Spain, the use of these drugs is strictly supervised by the government. Judged by the standard employed in those countries, between eighty and ninety per cent of the opium used in this country is improperly used. If the opium compounds were used by our people as they are used in foreign countries, 50,000 pounds would easily supply all of our needs.

It is believed that between 1,000,000 and 4,000,000 of our people are more or less seriously addicted to drug habits. The evils of the drug habit make themselves manifest both in social and business life. In a country such as ours, laws are comparatively inefficient in coping with an evil such as this. It is a matter extremely creditable to all concerned that manufacturers, importers and wholesalers of drugs are united in recognizing the evil of traffic in these compounds and they are voluntarily exerting a strong influence against their use.

Many of our soothing syrups and soda fountain drinks are more or less responsible for the formation of the drug habits. Then, too,

*West. Ost., March, 1911.

there is the prescription of the careless and thoughtless physician that annually fastens the habit upon large numbers of people. Just what is to be done to diminish the use of these drugs is a question by no means easy of solution. In a broad and general way we may say that the use is to be combatted by right living. There is comparatively little pain that is not the result of wrong living, and certainly in large numbers of cases pain was the primary cause for the formation of a drug habit.

The contribution which the osteopathic physician is able to make to the diminution of the use of these drugs is to so familiarize himself with the principles of his own practice that he will be able to control most cases of pain without resorting to a stupefying drug. It is quite possible that circumstances may arise where the use of the drug seems to be the only resort, but among our more intelligent practitioners such cases are not common. There are, of course, many advertised cures for the drug habit, but the value of most of these is extremely questionable. Certainly in many cases the cure is quite as bad as the disease.

A potent factor in the prevention of the habit is education. This, in my judgment, is more important than stringent laws. No matter how carefully the law may be worded, the person craving for a drug will be likely to find some means of evading it, but if young people grow to maturity with a full knowledge of the dangers incurred by the use of soothing and quieting drugs, they will not be very likely to begin their use. Let us, as a profession, give this matter the careful and serious thought to which it is entitled because of its importance.

There is a rapidly growing sentiment in all intelligent communities which favors the proper inspection and health examination of school children. This is necessary not only for the well-being of the child himself, but as a means of protecting other children from contagious diseases. It seems to us that all right-thinking people must feel that the inspector charged with these important duties is a most important public servant, and it appears to us that his first, and in fact his only qualification, should be fitness for this particular line of work. It is really a matter of little importance from what source his education was derived, providing he is educated to do this work as it should be done.

*ABSINTHE.

Absinthe is a narcotic liquor, which is made by distilling a certain species of wormwood with alcohol. The beverage resulting from this process possesses not only all the evil effects of alcohol, but also the still more evil effect of absinthe, which is extracted from the wormwood. The particular species of wormwood from which absinthe is obtained grows in eastern France and Switzerland. Taken in very small quantities, absinthe acts as a nerve stimulant, producing a marked feeling of exhilaration, which is followed by a period of great depression. Taken in any quantity, it acts disastrously upon the mentality of its victim—some of the results being hallucinations, both of vision and hearing. The delirium resulting from the excessive use of alcohol is very much milder than the delirium resulting from the use of absinthe. Not only is absinthe terribly disastrous to the nerve system of the individual, but it distinctly predisposes one who uses it to tuberculosis, pneumonia and the severer forms of epilepsy. Animals are affected by it in much the same way that people are. A dog which has been given a dose of absinthe will leap to its feet from its sleep and growl and bark and snap at empty space, evidently fancying in its delirium that it sees objects which are not present.

Of all people, the French are suffering the most from the use of this terrible drug. Between the years of 1901 and 1904, the amount sold to the French people increased from seventy-four thousand gallons to ninety thousand gallons. Many European countries and some of the countries of the West are now taking serious steps toward controlling the use of this drug, which fills poor-houses, insane asylums and jails, and which makes the man who uses it an irresponsible brute. The first country to prohibit its importation and use was Belgium. The good example set by this country was followed in turn by Holland, Switzerland and Brazil. It is now excluded from the United States, and Germany is taking strong measures to prevent its sale.

Its use is so widespread in France and there are so many money interests behind its sale, that the French have up to this time been unable to enact drastic laws controlling it.

Every intelligent physician should be ready to use his utmost influence against this drug, and help to create a public sentiment which will forever keep our people from becoming its victims.

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*West. Ost., Nov., 1912.

*COPPER SULPHATE IN EPISTAXIS.

In your issue of January, I noticed a short article on Epistaxis copied from the *New York Medical Journal.* I believe that much of the treatment suggested in the brief article is reasonably good and safe, but I certainly think that a strong protest should be made to using a saturated solution of copper sulphate. It is almost needless to say that a solution of this kind will nearly or quite destroy the mucous membrane to which it is applied. In fact, its value is due to the fact that it is destructive to the mucous membrane and that it stimulates the growth of connective tissue, really forming scar tissue in the part receiving the application. While this may stop the bleeding, it certainly paves the way for all kinds of future trouble.

As Epistaxis may be due to a number of different causes, I would respectfully suggest that it would be quite the natural thing for the osteopathic physician to find the cause and then attempt to remove it.

Some time we can say with Whittier:

"What matter I or they?
Mine or another's day,
So the right word be said,
And life the sweeter made?"

But that time is not yet. We have not made our full contribution to the medical profession, and in order that we may make this contribution, we must maintain an absolutely separate school of practice. I cannot agree with my friends who believe that we can maintain this separate school of practice, or even help to maintain it, by what seems to me the childish expedient of using separate degrees alone, but we can maintain the separate school of practice by having a definite system founded upon research and intelligent experimentation.

*Jour. A. O. A., March, 1910.

*MENDEL'S LAW.

It is now more than fifty years since an Austrian monk, John Mendel by name, made some most interesting discoveries in regard to the laws of inheritance, as the result of most patient work in the flower garden. Mendel's conclusions were presented to the world in a short but clearly written paper, but the scientific world had not yet ripened up to the point where his work seemed of any value and it appears that few people read the paper, and those who did read it straightway forgot what it contained.

Ten years ago, a little more or less, Hugo De Vries, a Hollander, rediscovered many of the facts relating to inheritance which Mendel had discovered forty years previous. The world was now ready for this information and the work of De Vries met with a warm reception. Quite recently Mendel's original paper came to light, and it was found that the conclusions of the two naturalists were strikingly similar. These laws of inheritance apply to almost every departure of nature. Statistics gathered from European as well as from American asylums for the insane and feeble-minded show that "Mendel's law," as it is commonly called, applies even to these unfortunates. Of course it must not be understood that the law is as exact as mathematics, but where large numbers of cases are examined, the deviation from Mendel's law is so slight that the deviation may be disregarded. The practical application of this law may be stated as follows:

First—Insanity will be inherited by all of the children if both parents are insane.

Second—Where one parent is insane and the other normal, but the normal one has one insane parent, one-half of the children will be insane and one-half will be normal, but all will be capable of transmitting insanity to their offspring.

Third—If one parent is insane and the other is normal and of pure normal ancestry, all of the children will be normal, but they will be capable of transmitting the insanity to their descendants.

Fourth—If both parents are normal but each has one insane parent, one-fourth of the children will be normal and will not transmit insanity to their offspring; one-fourth of the children will be

*West. Ost., July, 1911.

insane; the remaining half of the children will be normal but may transmit the insane taint to the offspring.

Fifth—If both parents are normal, one having a pure normal ancestry, the other an insane parent, all of the children will be normal and only one-half of them will transmit the taint to their progeny.

Sixth—When both parents are normal and of pure normal ancestry, all of the children will be normal and will not be capable of transmitting an insanity taint to their offspring.

We believe our readers will be wise in keeping this in such a place that it may readily be referred to, as questions involving the principles of inheritance frequently arise.

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*ARTIFICIAL FERTILIZATION OF EGGS.

It is now some years since Dr. Jacques Loeb demonstrated the fact that eggs can be induced to begin segmentation without fertilization. Dr. Loeb applied chemical methods to accomplish this result, and his experiments have gone far to modify many of our previous views in regard to the nature of fertilization. In most cases, the egg which is artificially started in its development does not progress very far until the embryo dies, but it has been recently found that if the egg of the starfish is chemically fertilized, and then kept in slightly concentrated sea water, it will progress far in its development.

Dr. Robertson, of the University of California, has succeeded in extracting from the sperm cells of some of the lower forms of life, living substances which are capable of fertilizing the eggs of that species. It now seems that the substance capable of inducing fertilization may be extracted from the body cells as well as from sperm cells. It seems that this substance may be extracted from the blood cells of cattle; possibly from other of the higher animals. The reason why this substance does not fertilize the ova of the female while the ova are yet within the body, appears to be that the ova are surrounded by an impenetrable membrane. Further experimentation along these lines may yet yield interesting results, and as we before hinted, many of our cherished ideas in regard to the nature of fertilization may have to be profoundly modified.

*West. Ost., Nov., 1912.

*THE ANCIENT CITY OF SANTA FE.

Few people seem to have any accurate knowledge of this interesting and wonderful old city. It is very easy for any one traveling over the Santa Fe railroad to get to the city and no person possessed of proper intelligent curiosity fails to feel exceedingly well paid for the time spent in going there.

Santa Fe is almost exactly eighteen miles north of Lamy, a small station in New Mexico on the Santa Fe road. Although the distance from Lamy to Santa Fe is so short, it requires almost one hour for a train to travel from one place to the other. This is due to the fact that Santa Fe is some five or six hundred feet higher than Lamy, so there is a stiff up-grade almost the entire distance.

The present population of Santa Fe is not far from 10,000. The people are probably nearly evenly divided between those of straight American stock and those of Spanish and Indian descent.

The streets of the older parts of the city are very narrow, many of them not being more than twenty feet in width. The most important place in the city is the old plaza. This is a park containing between two and three acres of land. Trees were planted here a good many years ago and the place is delightfully shaded. Originally this plaza was entirely surrounded by buildings making it a court yard, but it is now only on one side that a remnant of these buildings is to be found. This building is known as the old palace and it extends the entire length of the park.

Santa Fe was really an old city when the pilgrims landed on Plymouth Rock, and indeed it was an old city when first discovered by the Spaniards. Here was one of the important pueblos of a now forgotten race whose home extended from central Utah to far below the equator in South America. It seems quite certain that the race that built the great pueblos in Utah, in New Mexico, Arizona, throughout old Mexico, throughout Central America, down to the southern part of Peru, belonged to the same race and it is quite certain that these people were not closely related to the Indian savages with which the early European inhabitants of our country came in contact. On every hand in Santa Fe, one perceives evidences of the past. The old mission church in Santa Fe was first built on its present site sometime in the 16th century. It

*So. Pas. Rec., Aug., 1911.

has been more or less completely destroyed two or three times, but it still stands on the old site and the timbers which one sees on the inside of the church were old before the Revolutionary war began.

Close to the side of the church stands what is probably the oldest dwelling house in the United States. This old building was built upon the ruins of a dwelling house belonging to the prehistoric race of which I spoke. Until comparatively recent time it was two stories high, the upper story being now entirely gone but those who live in the single story are inhabiting rooms which could tell of perhaps more than a thousand years of human joy and sorrow. Look in what direction one will and he sees, standing side by side, buildings that are modern and symbolical of the life of today and the old adobe structures, symbolical of the past.

Until the continent was crossed by railroads, Santa Fe was one of the important points of exchange between the great southwest and the east. The long road which led from St. Louis and Kansas City to Santa Fe was known as the old Santa Fe trail and from this city other roads led to the important points of the southwest. Immigrant trains from the city of Mexico were met in the Plaza by immigrant trains from cities in the Mississippi valley and here the trafficking took place.

In this plaza in 1605 Onate raised the standards of Spain and proclaimed this city the capital of the Spanish colonies in that region. It was in this same plaza in 1680 that the Indians driven to desperation by Spanish cruelty, murdered the Spanish inhabitants and burned whatever they could of Spanish goods. In 1692, De Vargas re-established the power of Spain. In 1846, General Kearny, in this historical place, proclaimed the peaceful annexation of New Mexico to the United States. On a small monument commemorating this event is engraved the following:

"On August 19, 1846, General Kearny said to the inhabitants then assembled in the plaza, 'We come as friends to make you a part of the republic of the United States. In our government, all men are equal; every man has a right to serve God according to his heart'."

Here between 1840 and 1860, Kit Carson was a frequent visitor and here John C. Fremont, in the prime of his manhood and before he became the anti-slavery candidate for President of the United States, met other explorers, hunters and trappers and discussed the problems of the great Southwest.

In the center of the plaza stands a monument dedicated to the soldiers of the various Indian wars as well as to those who were killed in the Civil War. This monument was erected by appropriations made by the legislature of New Mexico in 1866-67-68. The fact that on the part of the monument dedicated to the soldiers of the Civil War, the term "rebel" is used three times, shows the intensity of popular feeling in New Mexico at this time. It may not be out of place to record that their patriotism was not equaled by their etymology for on this monument "February" is spelled "Febuary."

There is a fine federal building in Santa Fe and in front of this building stands a modest but solid monument of Kit Carson. On several sides of this monument occur these inscriptions:

"Kit Carson died May 23-1868,
age 59 years."
"Erected by comrades of the G. A. R."
"Pioneer, pathfinder, soldier."
"He led the way."

Even a brief sketch of Santa Fe would be incomplete without mentioning Fort Marcy. This historic old place (for nothing remains there now but some mounds) stands on a considerable height above the city.

Fort Marcy was the original site of the prehistoric dwelling. During Mexican days it was a military post. After the United States conquest of New Mexico, the old fort fell into ruins and as I have just said, nothing more remains of it than a few mounds and ditches.

Near Fort Marcy is an old cemetery surrounded by an adobe wall some five or six feet in height. This wall incloses a plat of ground almost square and about one hundred and twenty-five feet on each side. In this old inclosure one finds the old and the new strangely blended. On a grave which was perhaps old when Continental soldiers were starving at Valley Forge, I saw a dilapidated bicycle that some one had thrown away.

Near this cemetery are the ruins of an old church and a watch tower, the remains of which are still known by the old Spanish name of Garita. I could not suppress a smile when an old man who knew Santa Fe in the olden times, told me of the horrible cruelty of the Indians to the early settlers. He finished his story by telling me how he had seen numbers of the Indians brought in from the plains chained together like cattle and stood against the wall of the Garita and shot. As I listened to his narrative, it occurred to me that all of the cruelty and all the savagery was not confined to one side.

AMERICAN SCHOOL OF ARCHÆOLOGY.

Santa Fe, New Mexico, is the seat of the School of American Archæology. The Archæology Institute of America established this school in 1907 and it is under the immediate direction of Prof. Edgar L. Hewett. The headquarters of the school of archæology is in the old palace in Santa Fe. This building extends the entire length of the north side of the historic plaza of the city. It is one story high and two rooms in depth.

The wall running lengthwise of the building is of prehistoric origin and was so honestly constructed that all of the builders, beginning with the Spanish times, have utilized this wall. In a lecture which I heard Prof. Hewett deliver, he clearly explained how to distinguish between the walls belonging to the prehistoric races and the walls built under the inspiration of the Spaniards.

When the latter began to influence the construction of buildings they introduced the adobe brick and walls were built of this material. The prehistoric races simply puddled their clay and built an absolutely solid wall. In other words, the prehistoric walls were built in the same way in which we are building cement walls today.

The palace has been given to the school of archæology and is used by it not only for lecture room purposes but also as a museum and in this building, which is itself a specimen of the utmost archæological value, will be collected relics both of the prehistoric peoples of the southwest and of the present savage inhabitants.

The school of archæology is not only investigating the various ruins found throughout our own southwest and extending into Mexico and Yucatan, but it is studying the social life, manners, customs and folklore of the Indians, who are still living, and not only this, but they are making a phonographic collection of the songs and speeches of a people who are likely to be exterminated at no distant date.

It seems especially appropriate for a school of this kind to be established in Santa Fe. For this city is preeminently the capital of archæological America. One can hardly help inquiring what will be the effect of this special line of education. It is impossible to listen to the interesting and thoughtful lectures of Prof. Hewett, Prof. Thompson and probably others connected with the school without feeling that the tendency is to teach us that all men are brothers, and that these

*So. Pas. Rec., Aug., 1911.

ancient races had their hopes and fears, their joys and sorrows, their loves and hates very much as we today have similar passions and feelings. From a philosophical standpoint, we learn that there is a gradual weeding out of the unworthy in the human race; that both individuals and races, which are under the domain of the baser passions, lack the stamina and vigor of those who are better balanced and that in the mighty struggle for existence, the unfit are gradually crowded out.

Not only is this southwest region interesting to the archæologist, but it is interesting to the geologist and the paleontologist. Long before man in any form inhabited this region, it was thickly populated by gigantic animals that are now entirely extinct. One cannot visit the great museums and see these curious animal forms and the weapons with which savage men fought the most recent of these without feeling that:

"A sacred kinship I would not forego
Binds me to all that breathes;
I am the child of earth and air and sea.
My lullaby by hoarse silurian storms
Was chanted. Through endless changing forms
Of plant and bird and beast unceasingly
The toiling ages wrought to fashion me.

Lo! these large ancestors have left a trace
Of their strong souls in mine;
To grow and blossom as the tree,
And ever feel deep-delving earthly roots
Binding me closer to the common clay,
Yet with its airy impulse upward shoots
My soul into the realms of light and day."

The directors and students of the American School of Archæology are going to spend the latter part of the summer among the ruins of New Mexico and Arizona. They expect to accomplish the excavation of several ruined pueblos and it is highly probable that they will vastly increase our knowledge of a race that perhaps made the desert bloom with roses even as we are trying to do today.

Interesting reports and bulletins are issued from time to time by the school. Anyone who is interested in this work can keep in close touch with it through these publications.

OSTEOPATHIC PHYSICIANS

Osteopathic practice, though young in years, has already a sufficient number of practitioners in the field to make some internal fermentation almost inevitable. In our branch of the medical profession, as in other branches, there is a considerable number of mere drifters, men and women whose chief idea is to use their profession as a means of making a more or less precarious livelihood. Such go on from day to day with little thought of the real significance of their work and without any definite aim or positive convictions. There is another class of most earnest and conscientious practitioners who are intensely loyal to osteopathic practice, as it was understood years ago and as it is still understood by a considerable number of osteopaths. These people are practically lesion specialists. Their training, education and habits of thought fit them to deal with certain classes of diseases and to secure results gratifying to both patient and themselves, but they are not physicians in the broad sense of the term.

A very successful member of this class in the profession recently said: "It is with pleasure I feel that my success during the twelve years in the profession has, in a very great measure, been due to my effort to stick closely to 'simon pure osteopathic principles' in all my practice, and to *accept only such cases as I thought could be cured by these methods.*" An announcement of this kind is, of course, a public proclamation that this doctor considers himself a specialist, and not an all-around physician.

The third branch of the profession as we have it today consists of those who wish to practice as general physicians—men and women who hold themselves ready to take any kind of a case which may come to them. It consists of those whose osteopathic ideals are expressed in the statement: "The true osteopath is the true physician. He must be fitted to do the best thing possible under every conceivable circumstance of human suffering."

While no one would have the slightest justification for condemning the specialist, the fact still remains that the number who accept the ideal just stated is continually increasing, and it is the ideal which we must hold if we are going to develop our profession as it can be developed.

Whether pleasing or displeasing to us individually; whether in harmony with our personal interests or quite the reverse, the fact still remains that the present division of medical practice into various "schools" is a condition which will not long continue. It is simply a matter of time, and I believe of a rather short time, when we shall know so much about the human body in health and disease that the line of demarcation between the different systems of practice will fade away. Believing as I do that drugs are injurious and are not curative in their effects, I cannot think they will have any important place in the medical practice of the future, but it seems to me that hygiene, public and private, hydro-therapy, possibly electricity will, together with mechanical adjustment, be the means employed by the physician of the future in caring for the sick. Such of these methods as are proved to be reliable will be the common property of all physicians. Our colleges will then seek to educate men and women most thoroughly in the deep knowledge of the human body, and the students thus educated will all have equal rights, equal duties, equal privileges; and, since there will be no essential difference in their training and education, they will not be differentiated by different titles or degrees. The *osteopath* will be merged into the *osteopathic physician,* and he will use, as has already been suggested, those things which experience demonstrates to be the best in caring for the sick. Physicians thus educated in other than osteopathic colleges will perhaps employ slightly different methods, but gradually all must fuse into one common indistinguishable mass of doctors.

I believe this is not a gloomy outlook for our profession.

In one way, it is true, we shall lose our identity, but on the other hand we will have made our contribution to the universal whole. In other words, it will be in the medical profession as it is in our American citizenship. England, Germany, Austria, and other European countries send us their emigrants, but in two or three generations we have no longer Englishmen, Germans, and Austrians, but we have a grander product, and that is the American citizen. We shall still have our colleges, but we will educate physicians. Our concern at the present time is to send the best educated products into the field which it is possible for us to furnish.

*WOMAN'S SUFFRAGE.

It is only recently that I have realized that there is any "question" of woman's suffrage in the minds of intelligent men. It still seems to me absurdly incredible that in this land of boasted freedom, and in this age of the world's history, one-half of our people should seriously consider the possibility of denying privileges to the other half which that half may desire to possess.

To say that it would be infamously wrong to deny suffrage to women is putting it much milder than I feel like putting it. I have heard a number of arguments advanced as to why suffrage should be extended to women and all of these arguments have appealed to me as extremely valid, but there is one which I have not yet heard which seems to me to be of special importance, and that is the fact that the world is built in such a way that it is impossible to do wrong to anyone without the wrong-doing inflicting its greatest injury upon the evil-doer. We have, of course, heard of the heavens prepared for those who do right, and the hells prepared for those who do wrong, but many of us have suspected that much of the conduct which it is popularly supposed merits either place is conduct founded upon artificial and false standards; and feeling this to be true, we have in many cases grown away from the thought that punishment invariably follows wrong. In growing out of the thought that we are punished for our sins we have failed to recognize the great truth that we are indeed punished by them. We have expended our sympathy upon the wretched criminal who is murdered by a frenzied mob, forgetting that the death of the criminal is of little importance when compared with the evil which the mob inflicts upon its own members, by making them criminals. We have had stilted and absurd interpretations placed upon the declaration of a great teacher who said in substance. "Inasmuch, as ye have done either good or evil unto the least, ye have done it unto me," meaning ye have done it in spirit unto the greatest.

This statement embodies a profound truth. Wrong that is inflicted upon one member of the community because he is helpless is inflicted upon other members when they become helpless. Lowell saw this when he wrote: "Them that make black slaves of niggers, want to make white slaves of you."

Men who are willing to tyrannize over women because they hap-

*So. Pas. Rec., Apr., 1911.

pen to have an opportunity of doing so are men who tyrannize over their fellow men when the opportunity offers itself. It is a dangerous thing to get the spirit of tyranny and intolerance started in any community. One never knows where the lightning will strike.

I feel that every man who casts a vote next fall against woman's suffrage is a tyrant at heart and that the only reason why he does not tyrannize over me is because he can't, but at the first opportunity I may be the victim of his tyranny, and if for no other reason than with the thought of protecting myself against the tyranny of my fellows I shall vote for woman's suffrage.

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*THE COST OF LIVING.

The high cost of living is a subject which is receiving almost universal consideration, and many are the causes which are suggested. Some of the causes suggested seem rather fanciful,—others are probably real factors in the case. We may feel quite sure that the advance in the cost of living is not due to any one thing, but is due to a combination of conditions.

There is one means which we of South Pasadena have of reducing our cost of living. It has been tried in many other cities with success. The means to which we refer is to utilize the vacant land in our city,—to use it, not for growing weeds, but for growing vegetables which may be used as food. There are numerous boys growing up in our city who are laying no proper foundation for future usefulness; not because they are intrinsically bad, but because they have no definite employment. There are a great many acres of absolutely idle land in our city. We could not add to the physical health of the rising generation or to their moral stamina more than by engaging some competent gardener who would work with them and show them the dignity and worth of labor. This could be made financially profitable to the boys doing the work, and the right kind of supervisor, either man or woman, would teach them lessons which would be quite as valuable as any that they would learn in school or church.

*So. Pas. Rec., June, 1913.

*THE OAK TREE.

The oak tree belongs to an old and highly respectable family of plants. Of its ancestry we know little, but it is certain that soon after the age in which the greatest deposits of coal were made, trees not very unlike our modern family of oaks existed. It need be no matter of surprise to us that a family of plants so old as the Cupaliferæ (or oak family) should have become widely disseminated over the earth. At the present time we find trees and shrubs belonging to the genus Quercus (the oaks) growing in Japan, thence westerly over Asia, climbing high in the Himalaya Mountains, then broadly scattered over Europe from the oaks of England famous in story and song, to the oaks of Italy famed for their beauty. We also find them in Northern Africa, and when we cross the ocean they spread from the dreary frozen wastes of Northern British America to the tropical lands through which we have recently cut the Panama Canal.

Closely related to the oaks are the chestnuts, the beech, the filbert, the hazel nut, the ironwood and a number of other trees which grow only in tropical lands. In the far North and on the high mountains, the oaks grow only as very small trees or as bushes, while in more temperate lands and on the rich river bottoms the oaks grow into the true giants of the forest. Few trees produce wood which is of more commercial importance than the oak. It is almost unsurpassed in value as fuel, and oak lumber from the earliest ages has been regarded as appropriate for the greatest and most magnificent edifices. In Westminster Abbey, oak beams brought from Ireland in the days of William the Conqueror are as solid now as when they were first fitted in their places; and in the days of wooden ships, those built of oak were regarded as the staunchest and best.

In Northern latitudes the oak is deciduous. Its leaves die in the early fall, almost always assuming the most gorgeous colors and thus rivalling in beauty the maple tree. The dead leaves not infrequently hang on the tree during the greater part of the winter, and indeed sometimes they are pushed off from their stools by the swelling buds of the new leaves. In Southern climates the oak is an evergreen tree and this branch of the oak family is often spoken of as the live oaks. It is difficult for one to realize the beauty of these magnificent trees until he has seen them and studied them, not only with the eye of the

*P. C. O. "Reflexes."

botanist, but also with the eye of an artist. In the city of New Orleans there is a park in which live oak trees of gigantic size abound. In some cases the limbs extend a horizontal distance of seventy feet or more from the trunk of the tree. Some trees almost as fine may be found in the open canyons of the mountains of Southern California.

It may not be without interest to recall the fact that the old ship Constitution, which won such just renown during the war of 1812 and which inspired Oliver Wendell Holmes' poem, "Old Ironsides," was built of live oak, most of which was brought from Florida and all of it from the South. Perhaps I should add that her masts were made from good New England pine.

Here in California we have at least eight species of live oak trees, while about forty other species are found east of the Rocky Mountains. Some of our California species have a very restricted range and others, though widely distributed, are few in number. There is one specie which ranges from Altadena to Azusa. Between these places there are considerable numbers of these trees. One lone tree, however, is found near Santa Monica. Perhaps this lone tree tells of an acorn carried in the beak of some bird and which was dropped to the ground and lost rather than eaten. As before stated, the oaks which grow high on our mountains are little more than shrubs, many of them being only three or four feet in height, while on the low lands and broad river valleys they grow into veritable giants.

No one can familiarize himself with this wonderful family of plants without being impressed by the profound way in which these trees are influenced by their environment, and how in every case the forms which the trees assume are those which best fit them to live under the conditions imposed upon them.

SHORT BIOGRAPHIES

The following short biographies appeared in the Western Osteopath, during 1911-1914. They were published as editorials, for the most part.

HIPPOCRATES.

The origin of medical practice is lost in the fog of myths and fables. The Grecians, five hundred years before Christ, believed that the first physician was a demigod named Aesculapius, the son of Apollo. At this time, temples dedicated to Aesculapius were to be found in all the more important Grecian cities. It is highly possible that these so-called temples partook quite as much of the nature of hospitals as of places devoted to worship. The current mythology of that time accredited Aesculapius with having had a daughter whose name was Hygeia. This daughter was the goddess of health, and our modern word "hygiene" was derived from her name. As in many other myths, the serpent plays a somewhat important part, and Hygeia was represented by ancient artists as entwined by a snake, which was feeding from a cup held in her hand. It is quite possible that the connection between Hygeia and the snake was based upon a belief, which was common in Greece, that the snake renewed its youth by shedding its skin.

Hippocrates was born about four hundred years before the beginning of our era into this world of myths and fables. He is often spoken of as the "Father of Medicine," though when we read the saneness of his views, we cannot help feeling that his thought had been stimulated and directed by thinkers who lived so long before his time that their names are absolutely forgotten. For hundreds of years after his time he was alluded to in Greek literature as "The Divine Old Man."

When Hippocrates was born in Greece, disease was commonly attributed to the wrath of some offended god and attention was directed to fantastic methods of propitiating the god rather than to the public and private attention to cleanliness and care for sunlight and fresh air, which were then, as they are now, the most important agents in securing health. It seems that the energy of Hippocrates was specially directed against the supernatural cause of the origin of disease. The account which Hippocrates gave of the appearance of the face of the dying is retained in our modern medical treatises with little modification. While many of the views of Hippocrates will not stand in the light of modern investigation, they were, at the time they were announced, founded upon the best scientific thought of the age. In his discussion of inflammation, a condition which he clearly recognized, he explained it as resulting from the passage of blood into parts not previously containing it. With slight modification, his views of this subject fit our modern pathology.

Dr. Draper, in speaking of Hippocrates, says: "It appears that the practice of medicine in the hands of Hippocrates had reference to the course or career of disease rather than to its special nature." Nothing more than this masterly conception is wanted to impress us with his surprising scientific power. Not only did the life and work of Hippocrates serve to place the practice of the healing art upon a broad and scientific basis, but his life and his writings combined to impress physicians of all ages with the great moral responsibility which rests upon them. The Hippocratic oath, which until comparatively recently was taken by all physicians, is probably little modified from the oath which he demanded of his disciples. As this oath is more commonly referred to than quoted, we venture to present it in its entirety.

OATH OF HIPPOCRATES.

"I swear by Apollo, the physician, by Aesculapius, by Hygeia, by Panacea, and by all the gods and goddesses, calling them to witness that, according to my ability and judgment, I will in every particular keep this, my oath and covenant: To regard him who teaches this art equally with my parents; to share my substance, and, if he be in need, to relieve his necessities; to regard his offspring equally with my brethren; and to teach his art, if they shall wish to learn it, without fee or stipulation; to impart a knowledge by precept, by lecture and by every other mode of instruction, to my sons, to the sons of my teacher, and to pupils who are bound by stipulation and oath, according to the law of medicine, but to no other.

"I will use that regimen which, according to my ability and judgment, shall be for the welfare of the sick, and I will refrain from that which shall be baneful and injurious. If any shall ask of me a drug to produce death, I will not give it, nor will I suggest such counsel. In like manner, I will not give to a woman a destructive pessary.

"With purity and holiness will I watch closely my life and my art. I will not cut a person who is suffering from a stone, but will give way to those who are practitioners in this work. Into whatever houses I shall enter, I will go to aid the sick, abstaining from every voluntary act of injustice and corruption, and from lasciviousness with women or men—free or slaves.

"Whatever in the life of men I shall see or hear, in my practice or without my practice, which should not be made public, this will I hold in silence, believing that such things should not be spoken.

"While I keep this, my oath, inviolate and unbroken, may it be granted to me to enjoy life and my art, forever honored by all men; but should I by transgression violate it, be mine the reverse."

Surely, no one can read this and appreciate its significance without having a deeper regard for the moral side of his profession than before, and no one can think of its Grecian author without a profound feeling of veneration and respect. No one can read very much of the writings of Hippocrates without being impressed by the fact that he placed great stress upon ascertaining the cause of disease and then undertaking to remove that cause by what he considered rational methods. As this is the fundamental principle of osteopathy, we are safe in looking upon this great Greek as one of the forerunners of what we today consider rationalism in medical practice.

GALEN.

During the early centuries of the present era our civilization had its center in and around Athens. Western Asia Minor had been colonized at an early time by the Greeks. The city of Alexandria in Egypt had been founded about 300 B. C. by the Greeks and the civilization of this city and of Western Asia Minor was of purely European or Greek origin.

It was into this Grecian world that Galen was born about the year 130 A. D. He was born in the city of Pergamus in Mysia, in Western Asia Minor. Early writers often speak of him as Galenus Claudius, and Chaucer in his Canterbury Tales calls him Gallien. It is said that he began the study of medicine at the early age of sixteen. It is quite certain that during his life he lived a part of the time in the city of Smyrna in Asia Minor, then in Egypt, Alexandria and a part of the time in the city of Rome. He died about the year 200 A. D., but the place of his death is uncertain.

There are eighty-three treatises on medicine and medical subjects from his pen which are acknowledged to be genuine; aside from these there are nineteen treatises ascribed to him, but the authorship is somewhat doubtful. He was not only a busy physician, but an industrious writer, for it is believed that during his life he produced not less than five hundred distinct articles on professional subjects. His writings are known to have covered the subjects of anatomy, physiology, diet, hygiene, pathology, diagnosis, surgery, materia medica and perhaps some other subjects relating to the human body, either in health or disease. His knowledge of anatomy was derived very largely from animal dissection. He was one of the earliest writers to give special attention to the pulse and many of his views in regard to the pulse are strikingly in harmony with the views of today. It is in his writings that we find the first mention made of "critical days" in disease. He was strongly of the opinion that if a patient passed what he called his "critical day," he was not likely to die until the arrival of the next critical day. His critical periods were seven days apart. As we read his materia medica we are impressed with the fact that many of his remedies and some which he considered the most valuable, are now known to be absolutely inert. In one of his treatises is found the assertion, "Disease is something contrary to nature and is to be overcome by something contrary to the disease." Another rather striking sentence is, "Nature is to be preserved by that which has relation to nature." (Possibly this was a hit at the modern vibrator.)

There were medical sects in the days of Galen as well as at the present time. It appears that he gave a great deal of time and labor to an attempt to unite these various sects into one great school of the healing art, but it seems that the task was almost as difficult two thousand years ago as it is at the present day. No man is ever so strong intellectually as to ever completely rise above the views which are held by the masses of people of this time. Galen was no exception to this rule, for while many of his views are singularly strong and sane, his greatest admirers must still admit that he fell into many crude and childish delusions. One evidence of his strength is found in his insistence that experience is the only source of knowledge. He placed great value on the study of logic and mathematics and he believed that no system of theology would stand the test of critical investigation unless it were founded upon a profound knowledge of nature.

The best work which Galen did during his lifetime was done in the city of Alexandria, which was perhaps to be regarded as the intellectual center of the world. The Alexandrian physicians who were most profoundly influenced by the work of Galen became divided into two groups; one group was known as the Dogmatists. They asserted that the only rational foundation for the practice of medicine was a knowledge of anatomy, physiology, pathology, etc. Opposed to these were the Empiricists, who asserted that experience in dealing with the sick was the only foundation for medical practice.

Perhaps we are justified in feeling that osteopathic physicians have seized upon and combined both of these schools of thought. We cannot read of the work of these great physicians and teachers of the past without feeling that we are the heirs of all the ages and that they were unconsciously laying the foundation for the work which has blossomed in our own age.

ARISTOTLE.

Aristotle was born in northern Greece in the year 384 B. C.; he died 322 B. C. He came from a long line of physicians. His father, Nicomachus, was at the time of Aristotle's birth, physician-in-chief to Amyntias II., king of a province in northern Greece.

His early training, so far as we know, came from his father, but when he was seventeen years of age he went to Athens where for twenty years he was in immediate contact with the great mind of Plato.

When he was a little more than forty years of age, Phillip, King of Macedonia, appointed him tutor to his son, Alexander, who was afterward known as "the Great." In this way an intimate friendship was established between the great philosopher and the great conqueror.

Alexander became king of Macedonia six years after his acquaintance with Aristotle began, and he soon set out on that marvelous career of conquest which revolutionized the governments of the ancient world. In his career as a military leader, Alexander pushed into the Far East, even into India. Aristotle accompanied Alexander on this expedition, and as Alexander was at the head of a great military expedition so Aristotle was at the head of a great body of scientific men. It is probably quite safe to say that the army of scientists accomplished work which was of much more far-reaching importance than was that accomplished by the soldiers. It was at this time that many foreign animals and large numbers of plants were introduced into

Europe and the intellectual supremacy of Greece was established, partly, at any rate, upon the results of this expedition.

Aristotle's writings were not confined to medical subjects, as will be seen from the titles of some of his works: "On the Immortality of the Soul," "On Justice," "On Philosophy," "On the Good," "Logic," "Ethics" and "Natural History."

On his return from the extended expedition he supported himself as a physician and druggist in Athens. Up to the time of Aristotle most of the great minds of the world seemed to have reasoned by what is known as the deductive method, that is, they assumed certain things to be true and then inquired as to why and how they were true. On this basis all of the stories of the origin of the earth have been founded. Aristotle introduced what is known as the inductive method of reasoning. This method consists in first acquiring a knowledge of simple phenomena and from this knowledge proceeding to the more complex phenomena.

It is said that Aristotle had both an esoteric and an exoteric philosophy. By the former is meant the profoundest truth with which one is acquainted, and many ancient teachers believed that this should be communicated only to the choice few; while the exoteric teachings were the doctrine which, it was supposed, was good for the masses of the people. It is, of course, needless to say that all true thinkers have long since outgrown the thought of any justification of two systems. We have come to believe that the simple truth is plain enough for the most humble and that it is majestic enough for the most elevated.

The works of Aristotle were translated into the Arabic language during the eleventh century and almost all of our knowledge of him and of his teachings is derived from these Arabic translations.

Aristotle appears to have been an untiring student, and while he held many views which the progress of knowledge has profoundly modified, he at the same time must be credited with having laid the foundation stone of modern biology. He may have believed in spontaneous generation, but we can forgive that when we remember that he described with accuracy the structure of the heart.

The influence which Aristotle has exerted over human thought is probably greater than that of any other one man. For two thousand years his dictum was accepted as unquestionable truth. Men disbelieved the evidence of their own senses if this evidence was contrary to the statements of Aristotle. And yet, such is the nature of the human mind, he was without special honor in his own country and time. To those who knew him as a druggist in Athens he was "the vain and chattering little Aristotle."

This only tends to illustrate the pathetic fact that every one who rises above mediocrity lives in solitude, largely unknown and unappreciated by those most closely in contact with him. The higher qualities of the human mind are so comparatively recent in development that we have not learned to recognize those which differ appreciably from the qualities which we ourselves possess. The more primitive mental qualities have been so long possessed that they have become substantially the same in each person, and so it is quite easy with us to sympathize in the common every-day joys and sorrows of our fellows, but when it comes to the higher intellectual faculties, those things which make us most truly human, it is impossible for any one to comprehend with any clearness the feelings of another. This accounts for the remark which is so often made that the truly great person seems common when we are brought into contact with him.

AVERROES.

When Dante, guided by Virgil, made his somewhat remarkable trip through the Infernal Regions he came upon a place called Limbo. The people confined in this not particularly unpleasant place were those who had the misfortune to escape baptism. In the fourth canto Virgil says:

> "Then when a little more I raised my brow
> I spied the master (Aristotle) of the sapient throng
> Seated amid the philosophic train.
> Him all admire, all pay him rev'rence due."

He says that he also saw:

> "Euclid and Ptolemy, Hippocrates,
> Galenus, Arian, and him who made
> That commentary vast, Averroes."

The "commentary vast" to which he refers was Averroes' translation and comments on the works of Aristotle. This great work was issued in ten large volumes.

Averroes was of Arabian descent and he was born in the city of Cordova, Spain, some time between the year 1126 and 1198 and he died some time between 1198 and 1295. It will be remembered that some three hundred years before this time the Arabians had conquered Spain and had established a great Mohammedan civilization in that peninsula. At the time Averroes was born Europe was largely sunk in barbarism. Even the houses of the great still had floors of straw, and dignitaries of Church and State passed their lives with scant attention to the bath. European kings were for the most part unable either to read or to write, but in Spain a mighty civilization existed and the works of Aristotle and other Greek philosophers were eagerly read and studied, both in translation and in the original.

Averroes' early training was entirely along the medical line, but such was his character for uprightness that in middle life he was called to assist as a counselor of state. This high position given to a physician not unnaturally resulted in jealousy and enmity and Averroes was at least temporarily brought into disgrace. He was charged with cultivating and encouraging science to the detriment of religious faith, and for this he was cast into prison and subjected to most grievous humiliation.

After a few years spent in obscurity and in the practice of his profession, he was again called to public position, and there is reason to believe that in the evening of his days he enjoyed the confidence and respect of his countrymen.

As a physician, Averroes held singularly rational views in regard to the cause and treatment of disease. He held drugs in light repute and placed more emphasis upon right living. His translation of Aristotle was carried across the mountains into Europe and went far toward introducing rationalism into the medical practice of Europe. The more one reads of these early physicians, the more he is impressed with the fact that the rampant drug medication of today is comparatively new, and that the physicians of the middle ages held much more rational views than those with which they are usually credited. The statement which we have before made, that the osteopaths are the lineal descendants of the intelligent medical practitioners of medieval and modern Europe, certainly seems to be borne out by a close analysis of the facts.

During the middle ages the Arabs and the Jews made wonderful contributions to medical science, and it is deeply interesting to note how nearly in harmony many of the views which they expressed are with the views held by the osteopaths of today. Let us sincerely hope that Averroes, from his place in Limbo, may occasionally glance upon us and may feel that we are carrying on a work, some of the foundation stones of which were laid by him.

MARCELLUS MALPIGHI.

The seventeenth century was a fruitful one for science. The mind of man seemed to be awakening from its long sleep and from the peculiar theological hypnosis which characterized the middle ages. Until the eighteenth century was well advanced, little encouragement was offered to progress. Indeed, it is safe to say that the self-interest of the thinker demanded that he suppress his thought and that he yield simple and childlike obedience to the beliefs which were popular at that time. It is for tnis reason that the few individual thinkers of that age stand out with peculiar prominence.

Italy was in some respects the center of activity for this intellectual awakening. It was into a world of this kind that Marcellus Malpighi was born in the year 1628. His birthplace was the city of Bologna. Malpighi is described by his contemporaries as being a man of singular modesty, one given to quiet study and one who was of a singularly pacific and kindly disposition. Malpighi graduated as a physician from the University of Bologna in 1653. He immediately announced his intention of devoting his life to teaching and investigating, and in 1856, three years after his graduation, he was given the professorship of anatomy in his alma mater.

He remained in Bologna but a short time, soon going to the University of Pisa. He there made the discovery of the spiral character of the heart muscle. It seems that Malpighi was not only an unusually careful and accurate observer, both original and profound, but that he was a physician widely sought by the most eminent people of his day. In 1661 he published a paper describing the structure of the lungs in about the same way that their structure is understood at the present time. Previous to this time the lungs had been looked upon as a great mass of parenchymous tissue with no thought of the air spaces which they contained. The next year Malpighi described the circulation of blood through the lungs of a frog. In 1663 he began his work on the structure and character of the skin. Soon after, he demonstrated the mucous layer or pigmentary layer of the skin, intermediate between the true and scarf skin. He had separated this layer by boiling and maceration and described it as a reticulated membrane. Even its existence was for a long time denied by other observers but it remains in modern anatomy under the title of the Malpighian layer.

His next important work was a monograph on the structure of the silk worm. Until this time practically nothing was known of the structure of the bodies of insects. Working with apparatus which we would consider too crude for practical use, Malpighi demonstrated the existence of a circulatory system in the silk worm. He worked out its respiratory system and its reproductive system. His investigation of the urinary system was so accurate that future naturalists coupled his name with the tubes of this system, and to the entomologists of the present time the term "Malpighian tubule" is a common name.

From 1675 to 1679 Malpighi appears to have devoted his time almost exclusively to vegetable histology. Ninety-three of his drawings are of such beauty and accuracy that they might be used as illustrations in a modern text book. During the time that his attention was principally devoted to vegetable histology he turned aside for some work in embryology. Much of his work was done on the chick, and again his drawings were of great beauty as well as being remarkably accurate. At the time of Malpighi it was very commonly believed that the embryo existed, already formed in the egg, in somewhat the same way that the embryonic plant may be found in the ripened seed. Malpighi showed conclusively that this is not the case and that the embryo developed by a process of evolution.

Like many others of the world's great workers, Malpighi never enjoyed robust health, and in 1694 he died. Malpighi was a great naturalist, but of a new type; he began to look below the surface and essayed a deeper level of analysis in observing and describing the internal and minute structure of animals and plants, and when he took the further step of investigating their development he was anticipating the work of the nineteenth century.

ANTONY VAN LEEUWENHOEK.

(Van Luh'-wen-hook.)

Antony Van Leeuwenhoek was born in the city of Delft, Holland, in the year 1632. Ninety-one years later, in 1723, he died not far from the city of his birth.

He was a contemporary of Malpighi, and each knew at least something of the work of the other. Van Leeuwenhoek was not a physician, but his work was so closely associated with anatomy and histology that no history of medicine would be complete with his name omitted.

While Malpighi enjoyed the advantages of careful university training, Van Leeuwenhoek appears to have been entirely without this training. His lack of systematic training is shown in the desultory character of his work.

It seems that Van Leeuwenhoek was not obliged to give any special consideration to the matter of getting a living. He was a man of wonderful industry, but he worked because of his love for work rather than for the profit to be derived from it. His best work, aside from his work as an observer, was as a maker of lenses. These lenses were made of quartz and other natural crystals as well as of glass. He used no fewer than two hundred and forty-seven in his own work. These varied in their magnifying powers from forty to two hundred and seventy diameters. In harmony with the luxurious fashion of the times many of his lenses were mounted in silver and some in gold.

In 1673 he was elected a member of the Royal Society of London, and in this society he came to be known as the "man of many letters," for his communications recounting his scientific discoveries were in the form of letters rather than in more formal papers. In 1686 he demonstrated the presence of capillaries between the arteries and veins in the tails of tadpoles. His own account is as follows:

"A sight presented itself more delightful than any mine eyes had ever beheld; for here I discovered more than fifty circulations of the blood, in different places, while the animals lay quiet in the water and I could bring them before my microscope to my wish. For I saw not only that in many places the blood was conveyed through exceedingly minute vessels from the middle of the tail towards the edges, but that each of the vessels had a curve or turning and carried the blood back towards the middle of the tail, in order to be again conveyed to the heart. Hereby it plainly appeared to me that the blood vessels which I now saw in the animal, and which bear the names of arteries and veins, are, in fact, one and the same; that is to say that they are properly termed arteries so long as they convey the blood to the farthest extremities of its vessels and veins when they bring it back to the heart. And thus it appears that an artery and a vein are one and the same vessel prolonged and extended."

He continued his observations on the blood and circulation for a considerable length of time, but although he may not have been the first to discover the blood corpuscles, he was certainly one of the earliest and most critical observers of them.

He first observed and recorded the branching character and nature of the muscles of the heart, and so far as is known he was the first to observe the striation in the skeletal muscles, and he was the first known writer who gave careful attention to the microscopical forms of life found in water. His description of the various forms of these animalcules is interesting and is given in very quaint language, as the following extract will illustrate:

"In the year 1675 I discovered living creatures in rain water which I had stood but four days in a new earthen pot glased blew within. This invited me to view this water with great attention, especially those little animals appearing to me ten thousand times less than those represented by Mons. Swammerdam and by him called waterflies or water lice, which may be perceived in the water with the naked eye. The first sort by me discovered in the said water I divers times observed to consist of five, six, seven or eight clear globules, without being able to discover any film that held them together or contained them. When these animalcula, or living attoms, did move they put forth two little horns, continually moving themselves; the place between these two horns was flat though the rest of the body was roundish, sharpening a little towards the end, where they had a tayle near four times the length of the whole body, of the thickness (by my microscope) of a spider's web, at the end of which appeared a globule of the bigness of one of those which made up the body; which tayle I could not perceive, even in very clear water, to be moved by them. These little creatures if they chanced to light on the least filament or string or other such particle, of which there are many in the water, especially after it has stood some days, they stood entangled therein, extending their body in a long round and striving to disentangle their tayle; whereby it came to pass that their whole body, left back towards the globule of the tayle which then rolled together serpent-like and after the manner of copper or iron wire that, having been wound around a stick and unwound again, retains these windings and turnings." Such is the first known description of the beautiful bell animalcule.

His description of vegetable tissue shows that he almost anticipated the later discovery of the cellular structure of plants. While he was not the discoverer of the spermatozoa of animals, he was the first who gave any exact account of those cells. We need not be surprised to know that he greatly misunderstood their signification and believed that they represented the living organism of the next generation and that the maternal part of reproduction consisted in simply furnishing the nidus or bed in which these organisms might develop.

These remarkable discoveries made by Leeuwenhoek with his crude apparatus act as a constant rebuke to the investigators of today for not accomplishing more when supplied with the magnificent instruments which are now accessible.

GEORGE COMBE.

George Combe was not a physician, nor did he ever receive any special medical training, but he was a doctor (teacher) of health, both mental and physical. Like many other men who lived before their time, he was not fully appreciated by his own generation, but innovators usually are obliged to wait for future generations fully to appreciate their labors. The subject of this sketch belongs to the latter class, and, on account of his unpopular system of mental philosophy, he is not yet so well known in education as he will be in the next century.

George Combe was born in Edinburgh, October 21, 1788, and died in the same city, August 14, 1858. He belonged to the middle class of society. His early education was received in the parish schools of Edinburgh. In 1797 he was entered as a student in the high school of that city, and in 1802 he entered the humanity class under Prof. John Hill, in the University of Edinburgh.

Early in life, Combe began the study of the philosophy of the human mind. While still a youth, he read the works of Locke, Francis

Hutcheson, Adam Smith, David Hume, Dr. Reid and Dugald Stewart. He was not entirely satisfied with the philosophy of these writers and it occurred to him that he who would understand the philosophy of the mind must have a thorough understanding of the brain and central nervous system. This led him to become a profound student of the anatomy of the brain. As we read his philosophy, we cannot help feeling that he would most keenly have enjoyed our modern methods of work and preparation. Could he have used our Golgi method of tracing nerve tracts, it would probably have clarified many of his ideas in regard to the brain and brain structure.

The book of Combe which is probably the most widely known and which has exerted the most profound influence upon thought is his "Constitution of Man." In this work he discusses at length the relation of man to external objects. Although it was published more than seventy-five years ago, it is probable that no one has more clearly analyzed the nature of the human mind and the relation of the different faculties to each other. No one can read this remarkable book without more clearly appreciating his relationship to external nature and to his fellow man; and while a profounder knowledge of anatomy and physiology may modify some of the views held by Combe, it is hardly probable that his fundamental philosophy will ever materially be changed. It is not our intention in this series of biographical sketches to specially advertise any book, but we feel that this book is of such exceptional value that every one should make it a point to read it.

It is interesting to know that George Combe was at one time offered a professorship in the University of Michigan. We cannot help wishing that he had accepted this position, for it is quite likely that there would have been a better opportunity for full development in the free air of the West than in Scotland, where the greater portion of his life was spent.

His works on education were collected and edited in 1869 by William Jolly, Her Majesty's Inspector of Schools. They are now published in a large volume of 850 pages by MacMillan & Co. We feel safe in saying that George Combe was one of the most enlightened and enthusiastic educationists Britain has produced. Great as has been his influence as a thinker and philosopher, his services to education have scarcely been less notable, and will be of enduring value.

It may be predicted with certainty that George Combe will yet take a high position, not only as a pioneer, but as a permanent power in education. In the more exact and scientific investigation into the problems of education, it is not too much to say that few have surpassed him. George Combe was writing on the science of education in the early part of the century, when very few were engaged in that work; and there is no doubt that he was one of the earliest of the few investigators in the science of the human mind, who, like Spurzheim, Spencer, Carpenter, Bain, and others, have endeavored to render it truly philosophical. Combe was one of the earliest to advocate and welcome the establishment of normal schools in Great Britain. He was also one of the first to urge their erection in America, the first normal school in this country being at Lexington.

A part of the justification for this sketch of Combe is based upon the fact that he was a rationalist in every sense. His whole influence upon the medical profession was to do away with empiricism, and substitute for that, scientific diagnosis and rational treatment. One cannot read his writings along the line of psychology and physiology without feeling that he was laying the foundation for the rationalism which has blossomed in our own day under the name of osteopathy.

JOSEPH LISTER (LORD LISTER).

Dr. Joseph Lister was born in England in 1827. He came of good stock, and although his father was a merchant he was at the same time deeply interested in scientific pursuits, and it was in the year that his son Joseph was born that he succeeded in measuring the red blood corpuscle and that he observed the tendency of the red corpuscles to form themselves into roulaux.

Lister graduated from the University of Cambridge in his twentieth year, 1847, and five years later he obtained his degree of Doctor of Medicine.

The first scientific work which Lister did was on the eye and as the result of his investigation of this organ, he found that the muscle fibers of the iris were of the unstriated variety of muscular tissue.

In 1861 Listen began his work as a surgeon. In this year he was appointed Chief Surgeon to the Glasgow Royal Infirmary. The investigation which he began while connected with this institution divides the history of surgery into two great parts: One part is the history of surgery before Lister, the other part is the history of surgery after Lister.

He records that he was stimulated into the line of investigation which finally led to antiseptic surgery by the fact that the average death rate in the hospital was five each week from amputation of limbs. His first published statement in regard to wounds is: "The cause of suppuration and septicemia in wounds is due to the decomposition of blood and serum retained within them, brought about in some way through the influence of the atmosphere." This statement was made in 1862 or 1863. Soon after this Pasteur began his great work and, as a result of Pasteur's investigations, it was found that what Lister attributed to the atmosphere was really due to bacteria which were floating in the atmosphere.

Lister devoted thirty years to almost continuous work and investigation before the idea of antiseptic surgery was fully evolved. In other words, it was not until some time after 1890 that antiseptic surgery as we now understand the term was plainly taught by Lister. His own records show that the mortality in his cases of major surgery from 1864 to 1867 was fully fifty per cent, but as early as 1867 he had so far advanced on the road of antiseptic surgery that between 1867 and 1869 his death rate had fallen in the same character of cases to fifteen per cent.

The spirit of conservatism is so strong, even among the highly educated, that Lister's ideas of antiseptics made their way very slowly and in the face of the most strenuous opposition. The several steps in the universal acceptance of his views are the steps which almost invariably mark progress. Surgeons at first vehemently denied the truth of his statements. Then came the time when they admitted that what he said might be true, but that it did not make any difference, and we are now living at the time when every medical student is being carefully trained along the lines laid down by Lister, but so far as they know, people have "always" held the views which they are imbibing. The intelligent osteopath certainly should draw a little inspiration from Lister's experience. However strongly we may be opposed and however bigoted our enemies may be, they certainly can say no worse of us than they said of their own great teacher. The universe is sound at heart and its plan is such that error eventually dies and truth is absolutely immortal.

Of course we are all looking forward to the day when medical schools shall give way to the medical profession. That day, however, must not come until many more scientific questions are settled. Unity must come not from any species of compromise, but from a universal conviction that some method is right. Any peace, except the peace that comes from triumph of principle, is no peace. It is such men as Lord Joseph Lister who help to bring about unity which rests upon the sane basis of absolute knowledge.

ELIE METCHNIKOFF.

Each age has its own standard of greatness, and if we would be just we must judge men not by our own standards, but by the standards of the age in which they lived. The Hun, Attilla, is said to have built a monument to himself in the form of a pyramid out of the human skulls taken from those whom he had slain. Judged by the standard of his own people he could have had no greater monument. We are fortunate in living in an age when we regard the man who saves life as being much greater than he who destroys it.

Elie Metchnikoff was born in Southern Russia in 1845 and he is consequently 67 years of age. He is described as being short of stature, strong of build and a tireless worker. Like Louis Aggasiz, he has never "had time to get rich," though it is perhaps needless to add that he has had numerous opportunities for doing so.

The course of thought of the true scientist reminds one a little of the modern aviator. In his flight through the air the aviator knows nothing of artificial geographical boundaries. He passes from one state to another or from one country to another, thinking little of artificial divisions. In somewhat the same way, the true scientist knows little of the artificial boundaries of the several sciences, but in his work he seeks an end, caring little whether or not he keeps within the limits of the science which originally inspired the investigation. Neither Metchnikoff nor Pasteur achieved their highest success along the lines of the special sciences in which they were first educated. Pasteur began his life work as an inorganic chemist, and it was not until he observed that yeast regularly destroys one kind of tartaric acid and has little or no influence on another kind that he turned his attention to biology. Metchnikoff began his life work as a zoologist and his interest largely centered round the invertebrates, and it was while studying the circulation of the blood in some transparent microscopical forms of invertebrate life that he became interested in the subject of phagocytosis, or the destruction of organisms invading the body, by the white blood corpuscles. This was in 1882. Somewhat before this time Pasteur had conclusively demonstrated the bacterial origin of many diseases, and now Metchnikoff was beginning the great work of discovering at least some of the causes of immunity. The relationship of his work to modern medical practice is somewhat the same as the relationship of the philanthropist, who studies the cause of poverty and methods of relieving it, but who drops no penny in the beggar's hat, is to charity. Metchnikoff gave no time to the treatment of people already infected with disease, but he laid a broad foundation for the knowledge which shall prevent infection.

In the two years between 1882 (the date of the discovery of phagocytosis) and 1884, Metchnikoff had worked out the modern theory of inflammation. Briefly stated, he discovered that an inflammatory condition results from the battle which occurs between bacterial invaders of the body and the leucocytes of the blood which strive to destroy them. He had watched each stage of progress from the time that the bacteria first begin their invasion of the tissue up to the time when they conquer, causing either the death of the individual or the destruction of the organ invaded, or when the bacteria have been completely devoured and totally destroyed by the leucocytes. In 1895 Metchnikoff became the director of the Pasteur Institute in Paris. Under his direction this Institute has become one of the centers of scientific medical investigation for the world. This is specially true along the line of bacteriology and proto-zoology.

Metchnikoff is more widely known for his views on dietetics than perhaps for any other one thing. It is only just to him to say that he has been grossly misrepresented in the daily and weekly papers. In his work on inflammation Metchnikoff has shown the supreme importance of the phagocytes in preserving the tissues of the body from invasion.

Later in his life he believed he discovered that these soldiers of the body might sometimes act like the Prætorian guards during the last days of Rome. That is, they might unite to fight the body which they were designed to protect. In other words, that the phagocytes, which in the early part of life are useful in protecting the body from invasion, at a later time in life attack the tissues of the body and bring about their disintegration; that they are aided and abetted in this work by various kinds of bacteria and that these bacteria may be held in check by other vigorous growing bacteria which are incapable of uniting with the phagocytes for harmful purposes. Having formulated these views, Metchnikoff began his vigorous and systematic search for these bacteria which were to be antagonistic to the harmful bacteria of the body, and yet of themselves were to be harmless. He observed that while milk and meat were not very unlike from a chemical standpoint, they are quite unlike in the way in which they yield to decomposition. He observed that meat quickly becomes offensive and even poisonous, but that milk might undergo profound changes without becoming offensive. The bacterium which appears to be the most influential in bringing about these innocent changes in milk is the bacillus Bulgaricus. He finally came to believe that if this bacillus is freely introduced into the alimentary canal it will destroy the bacilli there which produce putrefaction and will itself be harmless. Whether or not his views upon this subject are sound and final is a question which cannot be answered in an off-hand way. Like many other hypotheses it probably contains an element of truth without embodying the whole truth.

It is pleasing to record that Metchnikoff is greater as a man than as a scientist. He is optimistic to a marked degree. The difference between the philosophic pessimist and the scientific optimist is finely illustrated by two incidents. The German thinker, Schopenhauer, held that death is preferable to life; that life, in fact, is not worth living, and yet when cholera broke out in Berlin in 1831 he quickly fled to Frankfort, but Metchnikoff, the optimist, the lover of life, went fearlessly last summer to Manchuria, into the hotbed of bubonic plague, so that he might learn how to diminish human suffering. The difference is one between the whiner and the helper.

In conclusion it is proper to call attention to the fact that no scientist of modern times has contributed more to sanity of thought along all medical lines than Metchnikoff, and no one has paid less attention to the foolish quarrels among the different schools of medical thought.

He undoubtedly sees, as do all who have eyes for seeing, that the day is not far distant when all different systems of practice must merge into one common system. When we think of the amount of honest investigation which is being carried on at the present time it is impossible to believe that the day is far distant when we shall not know the truth regarding the nature and treatment of disease, and it is evident that when this time comes the wide difference which now separates the several schools of practice must cease to exist.

ALFRED RUSSEL WALLACE.

Alfred Russel Wallace was born in 1823 and died early in November, 1913. At least sixty-four of his ninety-one years were spent in the active service of mankind. He was the last survivor of the great group of British naturalists whose combined efforts have revolutionized human thought. As long as our civilization endures, the names of Spencer, Huxley, Darwin, Wallace, Tyndall and Hooker will be remembered and revered. No matter how much future discoveries may modify some of the views held by these men, the great fact, that they more than others formulated the thought of the century in which they lived, will ever remain.

The names of Darwin and Wallace will each be closely associated with the discovery of the evolutionary origin of species. Darwin arrived at his conclusions while working over the rich collections which he made while traveling around the world in the British ship Challenger, and Wallace reached almost identical conclusions while living and studying amidst the wonderful profusion of life found in the islands of Sumatra and Borneo. Neither one knew of the work which was being done by the other, and both were ready at the same time to present their conclusions to a meeting of a scientific society which met in 1858. Neither of these eminent naturalists were able to attend the meeting of the society and each one confided his paper to his friend Hooker, who presented both of these papers which started a revolution in thought more far-reaching than any other which has affected modern civilization.

Wallace, like Darwin, was a prolific writer, and several of the books which he wrote in explanation of his views are not only vastly more profitable, but are actually more interesting than most modern novels. No one can read "Island Life" or "Darwinism" without being profoundly impressed both by the profound knowledge of the writer as well as by his charming literary style.

During the interesting period when the modern doctrine of evolution, now accepted by all thinkers, was making its way against the bigotry of the times, Alfred Russel Wallace bore his full share of the fight. After the battle was won, while other naturalists were pursuing purely scientific investigations, Wallace began to apply the doctrine of evolution to humanity and to human culture and his best efforts during the last twenty years have been in the line of social evolution rather than purely biological evolution. He has been interested in every movement in the last twenty-five years which has been made for the betterment of the human race, and it has been his fortune to live to see his views, which were at first violently assailed by almost every public teacher in England, accepted as the basis of modern civilization. He has lived to see charity, which always caused more paupers than it could relieve, placed upon such a basis of intelligence that the time-honored declaration that the "poor ye have always with you" may be shown to be erroneous.

He has labored to show that poverty was not to be relieved by freely giving while social conditions remained in such a state that a few gathered to themselves the product of the labor of the many. Wallace and others, stimulated by this thought, have taught us that in a true social condition no one lives at the expense of another, but that each person makes his contribution to the world and that each one is entitled to that which he himself produces.

With the death of Wallace there disappears from our civilization the last of the great foundation stones. However, the work which they did remains, and it is for us to rear upon the foundation which they laid a superstructure which shall be worthy of its foundation.

DR. ALEXIS CARREL.

Almost everyone has heard of the Nobel prize. This prize is a sum of $40,000 which may be given yearly to the one whom the Norwegian Parliament believes to have done the most for the advancement of humanity during a year which has just passed. One can only feel that "the wrath of man is turned to praise" when he remembers that this prize, which is the interest on money which was accumulated by manufacturing dynamite and powder, largely for military purposes, was a few years ago bestowed upon ex-President Roosevelt for being so largely instrumental in procuring terms of peace between Japan and Russia.

During the present year this prize has been bestowed upon the subject of this sketch—Dr. Alexis Carrel. Dr. Carrel is one of the workers in the Rockefeller Institute, which was founded several years ago by John D. Rockefeller for the purpose of medical research. A considerable amount of work, and exceedingly good work, has been done in this place. Mr. Rockefeller's attention was especially directed to the founding of this institution by the untimely death of a grandchild.

Dr. Carrel's first work was done in the Hull Physiological Laboratory in the University of Chicago, as early at 1905; he began experimenting upon the possibility of transplanting veins and arteries. In this line of work he met with considerable success. Time after time, sections of arteries and veins were cut from dogs and cats and replaced by sections taken from other animals. The next year he met with unusual success in the transplantation of limbs, and in 1907 he made the interesting discovery that arteries and veins which had been kept for a long time in cold storage could be successfully engrafted into living animals. In 1908 it was found that kidneys from one animal may be successfully transplanted into the bodies of others. In some cases he found that the arteries of the body underwent calcification when new kidneys were engrafted into the animal. As it has long been known that there is a close relationship between senility and the condition of the arteries, it is hoped that this observation may throw some light on the changes in the arterial system that takes place in old age. It has been said for some time that one is as old as his arteries, and that if some means can be found by means of which the arteries may be prevented from senile degeneration, that the period of youth may be correspondingly prolonged. Certainly the work which Dr. Carrel is doing promises to throw some light upon this important question.

Personally, Dr. Carrel is very far from the kind of man so often pictured as the typical scientific investigator. He is far more than ordinarily interested in literature and sociology; and he is particularly interested in certain phases of psychology.

The question of the influence of mind on the body, especially in all that relates to medicine and the wonderful physical conditions that sometimes follow strong influences exerted upon the mind, have always had especial attraction for him. Those who know him intimately think of him as a charming man of the world, with none of that self-absorption that is supposed to characterize the man who crosses the border line into the unknown in science and makes a path which others may easily follow. It will pay us to watch Dr. Carrel's course in the future, for it is he and others like him who are working to increase our knowledge in regard to the human body and its mysteries.

SIR WILLIAM CROOKES.

Sir William Crookes has recently been elected president of the Royal Society of Great Britain. This great honor is the fitting crown of a long and useful career. Sir William Crookes is now eighty-two years old, and he has been a member of the society of which he is now president for fifty years.

Modern chemistry has been mostly developed during his lifetime and he has recorded its development in the "Chemical News," a journal which he founded in 1859. He not only recorded the history of chemistry, but he went far toward making its history, as he has been a most prolific discoverer in the chemical field. No branch of chemistry was too humble and none too abstruse to receive his attention. For years he guarded the health of London by constant chemical examinations of its water and sewage.

He has shown that the atom is divisible and has thus overthrown established theories of the constitution of matter. He has lived to see the world accept his views which at first were almost universally rejected. Some years ago he expressed the opinion that all of the elements are but different forms of some primordial substance which he calley "protyle," and that the atomic weight instead of being one of the "constants of nature," is "a mean value around which the actual weights of the atoms vary within certain limits." This variation is especially true of the atoms of some of the metals of the rare earths. In 1900, Crooks proved the transmutation of some of the elements by extracting the radio-active element "Uranium X" from the mother of elements, Uranium. The beautiful "Crookes tubes" are known over the civilized world. In these, Crookes has contended, there is matter which differs from solids, liquids and gases as much as these differ from each other. His "rare earths" are rare no longer. Thoria and Ceria make our gas mantles. Almost every department of life has been enriched by his activities and we hope that his years may yet be prolonged.

WILLIAM J. HAYDEN.

Dr. Wm. J. Hayden died very suddenly on the morning of January 6th, 1914. His death in many respects took upon itself an ideal form. His last earthly work was done at ten o'clock or later on the preceding evening and he died before the rising of the sun the next morning. It must ever be a pleasant thought for his friends that his last work was done along professional lines for the purpose of relieving human suffering. His death was caused by a heart trouble probably known for some months by himself but entirely unknown even to those most closely associated with him.

Dr. Hayden was born in Missouri and was educated in one of her State normal schools and was, for some time, a successful teacher. He graduated from the Pacific College of Osteopathy in 1899 and immediately entered upon active practice in partnership with his wife, Daisy D. Duffey, whom he had recently married. He was one of the earliest osteopathic physicians to see the possibilities of the profession, and in 1909 he went abroad in company with his wife, Dr. Daisy D. Hayden, to further fit himself for surgical work. While in England he completed post-graduate courses in surgery in the West London Hospital and in the Seaman's Hospital, while she devoted her time to obstetrics and children's diseases. From there they went to Vienna, where they further enriched themselves in the great Polyclinic of that city. On their return to Los Angeles, they again resumed a general practice, but Dr. W. J. Hayden's skill as a surgeon became rapidly known and at the time of his death he had an ever-increasing practice in that department of medical work.

When the Pacific College of Osteopathy was reorganized under the educational laws of the State of California, Dr. Hayden became not only a member of the incorporation, but was made President of the Board of Trustees. For ten years previous to this time Dr. Hayden had maintained a close relationship with the college, and the good work which is now demanded in respiratory diseases is due very largely to the foundation which he laid when he lectured on that subject.

As a college man, Dr. Hayden was cautious but also progressive and he counselled wisely in many of the most important advances which the college has made. As a practitioner, Dr. Hayden was greatly beloved by his patients. Many cases of kindness and sympathy for those who were wholly unable to pay for his services have come to light since his death. He was pre-eminently disinclined to reveal to the public his inner and best life, and his tendency toward unselfish care for others is much better known since his death than when he was living.

Two years ago Dr. Hayden was appointed one of the clinicians in the Parent-Teachers' Clinic of Los Angeles and in this position his love for children and his care for the helpless found a fine field for development. His place in this line of work will be a difficult one to fill. As a friend Dr. Hayden was dependable and singularly helpful. Many of our young practitioners owe much of their success to his kindly help to them when they were entering upon practice. While he was diligent in business, he was free from all mean and petty jealousy and he never seemed to feel that the success of his neighbor would in any way detract from his possibilities for success. He was a broad-minded, just and patriotic citizen and while he never sought civic honors or place, he never failed to express himself upon all questions relating to the public welfare. He leaves a rich heritage not only to the profession in this state, but to the country at large. The skillful physician, the kind friend, the manly man, the patriotic citizen is dead, but his memory lives and the good that he has done falls into that great stream which passes down the ages. The individual will be forgotten, but the good influence which he exerted will live as long as humanity preserves its virtue.

"After life's fitful fever he sleeps well."

APPENDIX I.

The following report is reprinted for convenience in comparison with the articles on "The Opsonic Index," page 190, and "The Phagocytic Index," page 194.

*THE OPSONIC INDEX AS AFFECTED BY MECHANICAL STIMULATION.

Early in September, 1909, I started a series of experiments to determine the effect, if any, which the mechanical stimulation of the liver might have upon the phagocytic power of the leucocytes as determined by the Opsonic Index. Before attacking this problem I was obliged to make a few preliminary investigations.

A series of experiments convinced me that the caliber of the opsonizing pipette, providing its size is kept within ordinary limits, is not an important factor in phagocytosis. I also found, as a result of considerable experimentation, that the phagocytic power of the leucocytes is retained without appreciable diminution for at least twenty-four hours, providing they are kept at ordinary room temperature. I also found that blood serum kept at room temperature, and safely sealed from all organic matter, undergoes little or no appreciable change in its opsonizing powers in twenty-four hours.

Having established these preliminary facts, I made a series of experiments in the following way: I secured by own leucocytes, thoroughly washed in normal salt, and also my own blood serum. I then submitted to a strong stimulation of my liver, both through the innervation (this stimulation being given through the back) and a direct mechanical stimulation given by thorough massage immediately over the organ. Immediately after this treatment I again secured my own blood serum, and using the serum obtained before treatment as a control, proceeded to secure the opsonic index. Using the control serum in the same way, I also made the opsonic index from serum obtained several hours after the treatment had been received.

In all of these cases the meal question was constant, as I was taking only a light breakfast and then eating nothing until the evening dinner. As this work was done in the somewhat uncertain intervals

*Bulletin No. 1, A. T. Still Research Institute.

incident to one engaged in active teaching, I can make no claim to my work being absolutely free from error; but as I observed every precaution which I could, and as the results are somewhat uniform, I venture to offer the report for what it is worth. It is, of course, quite possible that further work, especially if carried on under more favorable conditions, might show some changes in the results. The work was carried on during the winter of 1909-10 in the laboratory of the Pacific College of Osteopathy, the exact dates being given in the following table. In this series of experiments I used an emulsion of killed bacilli of tuberculosis:

Opsonic Index one-half hour after stimulation.		Opsonic Index some hours (as given) after stimulation.
Index .98	November 2	After 4 hours, 1.4
" 1.1	November 8	" 4 " 1.3
" .99	November 30	" 4 " 1.1
" 1.2	December 6	" 5 " 1.2
" 1.	December 14	" 4 " 1.4
" 1.1	December 21	" 4 " 1.3
" .99	January 12	" 6 " 1.1
" .76 (?)	January 18	" 4 " 1.6
" .95	January 27	" 4 " 1.0
" 1.2	March 9	" 4 " 1.2
" 1.	March 23	" 3 " 1.2
" 1.1	April 13	" 4 " 1.4
" 1.	April 21	" 5 " 1.3

APPENDIX II.

The following reports were written from memory. The lectures were given at the end of two or three hour periods of laboratory work, during which the tissues under consideration were studied by students, and were made the subject of informal discussion and comparison. The short lectures which brought the laboratory periods to a close were for the purpose of applying and explaining the laboratory findings. These particular subjects have been included here, not because they are supposed to be of more value than hundreds of other such talks, but because they are more clearly remembered.

BIOLOGICAL RELATIONS—STARCH.

The leaves which you have been examining show the masses of chlorophyll as small granules within the cells which make up the structure of the leaf. This chlorophyll is at the very foundation of life, as we know it, upon the earth. It is the little things of life that count most, it seems, and these masses of chlorophyll illustrate this saying in a very good way.

Chlorophyll has the property of being able to make use of the rays of the sun as a source of energy, and by means of this energy to build up water and carbon dioxid into starch—or rather, into the glucosides from which starch can be made. In the process of making this substance, oxygen is set free, and this is used by animals and by the cells of plants, as a source of energy. In other words, there is a continuous cycle going on in regard to the oxygen transformations—the chlorophyll builds up the carbon dioxide, or carbonic acid gas, as it used to be called, with water, into the glucosides, and the plant cells complete the formation of starch granules. Free oxygen is breathed out by the plant into the surrounding atmosphere. The chemical equation is:

$$5\ H_2O + 6\ CO_2 = (C_6H_{10}O_5) + 12\ O.$$

Animals eat the starch, and breathe the air which contains the free oxygen. They utilize the starch as a source of energy—for muscular effort, for maintaining the heat of the body, and, to a certain extent, for building up the tissues of their own bodies. In order that they may utilize the starch—or, rather, the glucose into which the starch is converted—as a source of energy and heat, it is necessary that it be oxidized, and this reaction is performed by means of the air that the animals breathe, which contains oxygen which may have possibly been derived from the formation of the starch which the animal has eaten.

The starch is transformed by the cell of animals, of certain plants, by bacteria or by enzymes, into glucose,

$$C_6H_{10}O_5 + H_2O = C_6H_{12}O_6$$

This monsaccharid (simple sugar) is oxidized into carbon dioxid and water,

$$C_6H_{12}O_6 + 12\,O = 6\,H_2O + 6\,CO_2$$

The carbon dioxid is breathed out into the surrounding air by the animal, together with at least a part of the water in the form of vapor, and these substances are then ready to be again taken up by plants, and built again into starch with the evolution of free oxygen. The place of chlorophyll is thus a most important one in the history of life upon the planet. By means of this humble servant the tremendous energy contained in the rays of the sun is made available for use by animals.

It must not be forgotten that those cells of the plant which do not contain chlorophyll use oxygen and starch in their own metabolism in very much the same way that animals use these same substances. There is thus a reason why growing plants are not suitable decorations for rooms which are inhabited at night, since the plants use up oxygen in the darkness, but they are most pleasant and useful in living rooms which are sunny, because they use up the carbon dioxid of the air, and add oxygen to the air. It must be said, also, that these considerations are more theoretical than real, since the amount of carbon dioxid given off by any of the plants ordinarily kept in dwelling houses is extremely small, and the amount of oxygen which such plants give off is, also, practically negligible.

Starch is one of a complex series of compounds which are of great use to most animals and plants, and which are related to one another in ways not yet very clearly understood. Starch granules are formed through the agency of living cells under very different conditions. The tubers of many plants are composed almost altogether of starch, which has been formed by the living cells in that location, from the soluble substances formed in the leaves, etc., of plants, and carried down into the roots by means of the circulating sap. Cellulose, of which the plant tissue is composed, is closely related to starch, but is much more compact in structure. Cellulose cannot be digested as easily as starch; the human being is usually unable to digest it at all, though it forms the chief food of horses, cattle, and certain other animals. In the human digestive tract it is possible that bacteria may act upon cellulose, and that in this way a certain amount of nutrition may be derived from it, but the chief value of the vegetable foods which contain cellulose in abundance is due to the fact that such vegetables contain salts necessary to the body, and also to the fact that the cellulose gives bulk to the digesting food mass, stimulates peristalsis, and thus promotes the digestion of other food elements.

Glycogen, sometimes called "animal starch," is deposited in the liver and in the muscles. Glycogen can be manufactured from proteid foods as well as from the starches and sugars of the food. Glycogen is again changed into sugar, and thus made available for use by the body when the sugar content of the blood becomes diminished. During starvation, it seems that the glycogen disappears from the liver and from the muscles first of all, and the fats of the body are used afterward. Glycogen is of interest also in connection with certain pathological degenerations, to which I shall call your attention at some future time.

BIOLOGICAL RELATIONS—NITROGEN.

Another foundation for the structure which makes life possible is found in activities of the nitrogen-fixing bacteria. The nodules which you have been examining, which are growing upon the roots of the bean, pea, alfalfa, and clover, are due to the presence of these bacteria. These illustrate the condition known as "symbiosis" by which we understand a condition in which two organisms live together, one supported by the other, and giving some advantages to its host. In this case, the plant—always some member of leguminous family, to which these plants you have been examining belong—is the host. The bacteria live upon these roots, as is the case in most infections, but in these particular infections the bacteria are of advantage to the hosts, and, in a way, pay their board, if the saying may be taken in a very indefinite way. The nitrogen-fixing bacteria have the power of using inorganic nitrogen as food for themselves, and thus, by combining nitrogen into an organic compound, they make this most necessary element of protoplasm available for use by higher animals and plants.

Leguminous plants are those which bear seeds in pods, and which have ten stamens,, arranged in two groups, one of which contains nine stamens, while the other is composed of a single stamen. The blossom of the plant is also characteristic, and this is shown conspicuously in the familiar blossom of the sweet pea, and that of the locust tree. All of these plants are subject to infection by the nitrogen-fixing bacteria, and for this reason they are able to grow in very poor soil, and to make the soil richer by the very fact of their growth upon it.

The story of nitrogen, from its place in the atmosphere, of which it forms about four-fifths, is something like this:

Atmospheric nitrogen permeates the soil, especially where it is loose, and thus it comes into relation with various salts. During storms, as the result of the electrical energy, and perhaps in other ways not yet well recognized, the nitrogen unites with hydrogen from water to form ammonia. This ammonia, carried into the soil, unites with the salts of the earth to form various inorganic nitrates. The nitrogen-fixing bacteria are able to use these inorganic salts, and possibly also the free nitrogen, in the formation of their own protoplasm. The organic material thus provided is used by the leguminous plants which the bacteria infect; the plant is used as food for animals, or it is allowed to decay in the soil, making the soil sufficiently rich in the organic nitrogen compounds for other plants to grow upon.

The whole process of animal and vegetable life, the existence of even the highest types of animal life, even to the brain of the human being, is thus seen to be built upon a foundation laid down by the activities of two remarkable organisms,—the chlorophyll of green plants, and the nitrogen-fixing bacteria of the roots of the leguminous plants. The first utilizes the energy of the rays of the sun in the formation of the oxidizable carbohydrate compounds, which thus represent potential energy, and which give the energy to cells and to individuals, and which help to make up the protoplasmic molecule; the other provides for the utilization of the great sea of nitrogen around the earth in the formation of the protoplasmic molecule, by means of which the extremely complex and unstable and changeable chemical syntheses and analyses characteristic of the living cell become possible. Without these two humble servants, life as we know it upon this earth would perhaps be utterly impossible.

ADAPTATIONS.

The history of life upon the earth is a history of constant battles. Varying relationships of living creatures with one another, and of these with the inorganic world, have compelled the development of most remarkable adaptations. This is illustrated plainly in the history written upon the shores of the lakes in Utah and Nevada. Here, the lakes have undergone great changes during the geological eras. Periods of considerable rainfall filled up these lakes, which have no outlet, with fresh water; periods of scanty rainfall permitted the gradual evaporation of the water, until the lakes became progressively more salt. The history of these climatic changes is shown in the varying character of the shells left upon the beaches at successive levels. Fresh water forms are numerous in the deposits made during the periods of plentiful rainfall. During the gradual increase in the salt content of the water, the character of the animals living in the water changed, until finally only those organisms which were able to live in quite strong salt solutions left any records in the beach levels formed during periods of scanty rainfall.

There is, in the flora and fauna of any country, a sort of natural balance, by means of which various infections, various insects, animals and plants act and react upon one another. Parasites may attack plants, but there is usually some insect to attack the parasite; birds, in turn, may live upon the insects and carry the seeds of the plants. Other animals may attack the birds, eat the plants, and, in turn, yield to the invasion of bacteria or parasites of other kinds.

Such a balance of power in life can be secured only at the expense of many a battle field. No doubt organisms have gained a foothold in every country, only to be forced to the wall, and finally to extinction, by the presence of disastrous and overpowering attacks made by other forms of life. Sometimes instead of dying, the organism develops some defensive armor, and what seems to be some new specie is produced. This can be done artificially with remarkable results; practically all of our domestic fruits and vegetables have attained their present great size and delicious flavor as the result of generations of selection and experimental cross-fertilization.

This biological balance is often disturbed by man,—sometimes with disastrous results. For example, the Scotch thistle is a rather insignificant and harmless plant, in its home country, but when it was carried to Australia by a sentimental traveler, it quickly escaped all reasonable limits and became a most destructive pest. A similar occurrence led to the development of a pest of rabbits in Australia.

The manner in which organisms adapt themselves to adverse elements is a most interesting chapter in biological history. For example, in almost any locality the rocks contain records of huge animals which dwelt there during geological ages. What became of these animals? Some of these great forms lived within comparatively recent times, geologically speaking,—you remember that in Siberia the flesh of the frozen mammoth was used as food by some members of an exploring expedition, and that this flesh was very useful as food for the dogs of the party. It is not possible to say how many centuries this flesh may have been kept frozen, yet it is certain that these great animals lived only yesterday, in a geological sense. You have seen the tusk of the sabre-toothed tiger, in the collection made by Dr. Frank Clark; this animal must have lived in this country quite recently. This specimen, with others, was brought from the asphaltum lake near Santa Monica. We can only make the wildest attempts at conjecture as to the cause and the manner of death of these extinct animals. The fact that remains of insects resembling the tse-tse fly have been found associated with these remains suggests at least the possibility that some protozoan, perhaps like the trypanosome Gambiense of sleeping sickness, may have caused the extinction of whole races of these animals.

The changes of bodily temperature,—the development of what are generally called "warm blooded" animals, which simply means animals which maintain a constant and equable body temperature through changing climatic conditions,—may have been due to infection by some parasite, perhaps something resembling the malarial protozoan. It is known that a temperature of about 98° F. kills, or at least inhibits the growth, of several of these organisms. This is certainly one factor in preventing the occurrence of infections,—for example, fowls become subject to several bacterial invasions if they have the body temperature lowered before they are exposed to the infection, whereas under normal conditions they may be almost or quite immune to the same pathogenic organisms. So, in many of the feverish conditions, the raised temperature may be an attempt at the destruction of the bacteria. It is needless to say that in many cases the increased temperature injures the cells of the body, perhaps injures them more seriously than the action of the invading bacteria would injure them, but the fact that increased temperature could help to destroy infectious organisms is very probably responsible for the development of the higher temperature,—the "physiological fever" of birds and mammals.

It is only a comparison, and must not be carried too far, else it loses what little virtue it has as a comparison, but I cannot pass over the opportunity of calling your attention to the fact that in the bodies of higher animals, and especially of mammals, there is also a sort of biological balance of power. The various organs of the body work together, according to the rules which have been provided through countless ages of adaptation. There is a sort of balance between the intake and outgo, between the different internal secretions, between the sensory nerve impulses and the outgoing motor reactions, as well as between sleep and rest and other physiological activities of the body, which enables the members of the human race, and the mammals in general, to meet the ordinary emergencies of life in an efficient manner. And it is as dangerous to meddle with this balance as it was to take the Scotch thistle to Australia. It is a very dangerous thing to interrupt or to modify the balance between the various structures of the body. It is true that the human body is not theoretically perfect, but its parts are adjusted so that it works well enough,—probably every organ of the body is able to meet not only the ordinary emergencies of life, but also some very extraordinary emergencies in an efficient manner. The removal of organs whose functions are not well known is a very dangerous experiment; not only is the functional activity of the removed tissues lost to the body, but the balance between the various other organs may be seriously disturbed. There are cases in which the removal of organs which are badly diseased is necessary, but it is extremely important that one should be very certain that this is the most rational procedure before he advises the removal of any organ of doubtful, or even of certain, function.

The same principle holds true in adding substances to the body. Anything taken into the stomach is subject to the action of the digestive secretions, and it also may fail to be absorbed into the body, whether it is acted upon by the digestive secretions or not. Even the best educated of medical physicians "pours medicines of which he knows little, into bodies, of which he knows less," and the administration of drugs by the mouth is dangerous enough, at the best. Still, by this means, the body has some opportunity of protecting itself against their ill effects. But recently the use of the hypodermic needle is becoming so common, and there is so great a tendency to the use of serums in the treatment of disease, that the danger of meddling with the organic balance of the bodily organs must be strongly emphasized. Substances injected into the tissue spaces, and, still more, into the veins, act upon the body cells with no check whatever; the body has no chance to guard itself against the invasion; the cells are helpless to protect themselves, no matter how injurious the substances injected may be.

Especially dangerous is the injection of foreign proteids into the body. It seems that many of these compounds, which may, indeed, be useful articles of food when taken into the body in the ordinary way, become intensely toxic when placed directly into the circulation. Not only may the immediate effects be bad, but certain complicated changes of the body's metabolism may be brought about which lead to most disastrous effects at some later time. It cannot be too strongly emphasized that we are running a risk, and a most serious risk, when we disturb the biological balance of the organic relations of the body in any way.

INFECTIONS.

(The course in biology included some microscopic study of the tissues of plants and of the lower animals.)

You have all, I believe, been provided with specimens of these stems and leaves, each of which shows evidences of various infections. In every case, in the plants examined this morning, the infectious agent seems to have gained entrance into the deeper tissues of the plant through some injury to the protective outer layer. There are certain parasites which injure plants and not only gain entrance to the deeper tissues for themselves, but also allow bacteria and perhaps other organisms to infect the plant. For the most part, however, the bacteria, the moulds and the other varieties of infectious agents gain entrance into the plant in some such way as you have noticed in these stems,—by way of some structural injury to the plant epidermis.

What is true of plants seems to be true to a great degree of higher animals and also of the human body. There are a few bacteria which are parasitic,—that is, they are able to live upon the healthy body, or in the secretions of the healthy body. But by far the larger number of the bacteria which invade the human body are saprophytic, that is, they live upon dead organic material primarily, and only are able to exist within the body by finding, and later by producing, dead or dying tissues. To such bacteria, the healthy body is immune.

The importance of correct structural relations cannot be over emphasized. Even in plants this is an important factor in guarding against infection. Vigorous growth, strong and healthy vitality, go far toward preventing infections. Even those infections which are capable of attacking trees which appear to be fairly resistant, make a far more destructive onslaught upon plants which live in poor soil, which are surrounded and choked by weeds, and which receive scanty supply of water.

Even more, in the higher organisms, and in mammals and the human race, where there is so great complexity of structure and relationship, and where certain organs of the body seem to provide antitoxins and other weapons of defense, is it needful that structural relations should be maintained in as nearly their normal state as possible. We know too little of the body, and of the manner in which it acts under normal conditions, much less under the effects of abnormal conditions, to permit us to interfere with the structural relations hastily. There are, apparently, cases in which the presence of serious diseases compels the removal of the tonsils, the appendix, and other organs whose functions are still somewhat doubtful. It is also true that there are conditions of serious diseases which compel the removal of the right hand, but one would certainly give very serious thought to the matter before he would permit the removal of his hand, whereas the removal of the tonsils, the appendix, or other structures which may be even more important and necessary to the health of the body may be hastily advised with little or no consideration of the possible harm that might ensue.

MODERN DIAGNOSIS.

In the "good old days that are past," the diagnosis and treatment of disease were easy matters. The doctor listened to a recital of symptoms, asked a few questions, perhaps looked at the tongue of the patient, possibly even counted his pulse and noted its characteristics in a vague way, or took his temperature with a clinic thermometer. Then he told exactly what the trouble was, wrote a prescription or filled it from his case, and the patient either died or recovered, as the case might be. The drug was supposed to exert a destructive effect upon the disease, or a curative effect upon the body.

This was a pleasant fable, and one which has soothed many a dying bed and comforted many a bereaved family. It was a fable which has caused many a bed to be a dying bed which should not have been a dying bed, and it has caused many a family to be bereaved which should not have been bereaved. It cannot be too strongly insisted upon that comfort which is derived from things that are not true, and the consolation which cloaks facts and precludes investigation must, in the very nature of things, lead to further disaster. And the giving of words which cloak ignorance, and which lead to a false security and which cause us to rest satisfied with an amount of knowledge which is insufficient to govern our acts wisely, is a very dangerous thing for the race. Ignorance which is recognized may be only a step to better things, but the ignorance which is satisfied with itself can only go down to certain ruin. It is no disgrace to be unable to name a disease and to be unable to outline satisfactory methods of treatment speedily; it is a disgrace to be willing to be satisfied with the false diagnosis which rests upon guess work, and to depend upon therapeutic methods which are based upon guess work and empiricism and fable.

Suppose your watch should cease running, or should not run regularly. You might guess that it needed winding, and try winding it up. If it goes along fairly well after that, you suppose that perhaps the winding was the thing it needed. You might shake it, and it might run fairly well for a few days; you might guess that a bit of lint had gained entrance into the works and blow into the case; the watch might run correctly after that. But if you should take your watch to a jeweler you would scarcely be satisfied with his skill if he had no better methods of diagnosis and treatment than such things as these. You expect him to know the mechanism, and to be able to make such examinations as are necessary in order to find the cause of the condition, and to be able either to remove the cause of the disturbance or to tell you the nature of whatever irremediable defect he might find present. People may tinker with their own bodies, with more or less disastrous results, but when they go to a doctor they should expect the advice and the treatment that rests upon a certain and exact knowledge of the conditions as they are, in the body of the sick person.

The body is different from most machines in being more delicate and more complicated, and also in being so thoroughly guarded from examination. We may think of some extremely fine piece of machinery in a locked room, and so firmly associated with the walls of the room that any attempt to enter the room must necessarily destroy the machinery. As long as the machine works all right, and serves its proper purpose, there is no need for us to try to go in, but when there is some disturbance, it is necessary to find out, if possible, the cause and the best manner of securing relief from that disturbance. We may suppose that there are a few windows in the walls of the room, and that these windows are placed in such a way that each gives a view of certain parts of the machine. We would all agree that before trying to advise concerning the best method of dealing with any irregularities of the running of such a machine, that we should look into as many of these windows as possible and that we should employ magnifying lenses, and whatever other apparatus we might find useful in making our vision more clear and our knowledge more exact. We might analyze the fuel and the oil which were being used, in order to determine whether any cause of the disturbance might be found in these, and we might examine and analyze the ashes and the smoke, in order to determine whether the machine was able to make normal use of the fuel provided. Now some such thing is true of the body, though the comparison cannot be pushed too far. When there is any disturbance with the functions of the body, the first thing to do is to find the cause of the disturbance. We can examine the orifices of the body; we can listen to sounds which are heard through the walls, the sounds of the heart and the lungs, and we may use the various other methods of physical diagnosis, etc., which are all capable of giving much useful information. We may analyze the urine, and examine the sputum, the gastric contents, the blood, etc., and each of these examinations is a sort of window by means of which we may look into the room and see how the machinery is running. We may thus find out the real nature of the disturbance, and its cause, and also how best to remedy the condition. We may all agree, too, that while it might be that should we look into several windows without finding anything of especial interest, that would not be any very serious loss, but if we should neglect some window, in our search for a correct diagnosis, and that window would happen to be the one through which a view of the mechanical error could be seen best, it would be a mistake, and a most serious mistake. Indeed, it is quite conceivable that such neglect might be the means of failing to provide such methods of treatment as would be necessary in order to save the life of the patient.

This is my plea, that every one of us should neglect no source of information when we are dealing with sick persons. That while an effort to make a careful study of every patient may cause us to make some tests which do not add to our knowledge of the case, yet this is a very small thing compared with the chance that any one of these examinations may give us the information necessary to making the most speedy recovery and sometimes to saving life itself.

Not only is our success in dealing with individual patients assured by such careful diagnosis, but such habits go a long way toward placing our profession firmly upon a sound scientific basis.

NEOPLASMS.

It must be remembered that the cells of which tumors of all kinds, both benign and malign, are composed, are derived by the ordinary processes of division, from pre-existing cells. The tissues of which these tumors are composed, however malignant they may be, are invariably of the same type as those found in the body at some time in its existence, either at an early time of embryonic life or at some later period. There is nothing essentially abnormal in these cells, except the fact of their wild and uncontrolled multiplication. Indeed, it may almost be said that there is no such thing as a strictly pathological tissue,—by this I mean that every tissue found in the body in the form of a tumor is representative of some tissue which is present in the body normally at some period of its development. The tissues which make up tumors are out of place, and as the result of their abnormal location they may depart very widely from their original appearance; yet enough of the cell characteristics usually remain to enable them to be recognized upon a careful examination.

Huxley defined dirt as "matter out of place," and we may paraphrase this by saying that pathological tissues, and to a great extent, pathological phenomena in general, are merely cells and physiological phenomena which are out of place.

Why it is that certain cells of the body begin to undergo this disastrously rapid multiplication at certain times and under certain circumstances, no one is yet able to say. The Cohnheim theory, which supposes the existence of what is called an "embryonic rest" has much to commend it, though it does not solve all of the problems presented by the facts of cancer growth. This you have already considered in the earlier part of your work.

You have noted in the slides and gross specimens which you have been studying, that those tumors whose histories have been given you have certain characteristics in common; the tumors which have been removed on account of the discomfort or other symptoms resulting merely from the size of the tumor, or from its pressure upon neighboring parts, are, for the most part, somewhat harder in texture than the more malignant tumors; they have fairly well marked limits, and appear to have been shelled out of the body,—as, indeed, they may have been. The patients from whom such tumors have been removed often appear to be in reasonably good health, and they recover speedily from the operation. In other words, such tumors are called "benign" because they are not particularly toxic in their influences upon the general health of the body, and almost the only harm for which they are responsible is due to their size, and to the mechanical injury they produce in neighboring organs.

Upon microscopical examination, these tumors resemble the tissues of adult organs. The fibroma resembles adult connective tissue, the adenoma resembles adult glandular tissue, the myoma resembles adult muscular tissue, and so on. When such a tumor shows within its structure cells which resemble embryonic tissue, when the cells are engaged in rapid multiplication, when they are thin-walled, have large round nuclei, and when the intercellular tissue is very small in amount, then there is danger of this tumor's assuming malignant characteristics,—and thus it becomes a very dangerous thing to be retained within the body. This change does occur, not very rarely. It is not possible, at the present time, to decide whether the intrinsic cells of the tumor change their characters, as the result of their peculiar environmental conditions, or whether the irritation due to the presence of the benign growth stimulates the neighboring cells, perhaps some of them embryonic rests, into rapid growth. It is, of course, quite conceivable that a malignant growth might be a neighbor, and a very close neighbor, of a benign tumor.

There is another series of tumors which have been received either from operations or from autopsies, in which the mass presents quite different characteristics. In the first place, no recognizable wall is found. Only when an organ which itself has a wall, is permeated with cancer cells, does there appear anything like a limiting membrane. So far as this type of tumor is concerned, it has no limits, but spreads diffusely in almost every direction, invading and destroying the neighboring tissues, much as the embryonic glands and blood-cords invade and occupy the neighboring mesoblast.

You will notice also that these soft tumors have very marked and tortuous and dilated blood vessels. Also, there is a tendency for these tumors to break down, and, if infection occurs, to undergo suppuration.

On microscopic examination it is found that these blood vessels have extremely thin walls,—indeed, it is not rare to find the walls apparently lacking, either on account of the rupture of the vessel wall, or on account of the fact that the cancer cells have invaded and filled the original vessel, until its walls have been lost in a mass of the cancer cells. Such tumors are indeed extremely dangerous to life, and the danger is partly due to the fact that the cells which invade these thin walled vessels are so easily carried to other and perhaps distant organs of the body, there to begin a new colony of growing cancer cells. These colonies, or metastases, are composed of the same type of cell as the original growth, and it is sometimes possible to determine within fairly accurate limits, the origin of the primary tumor. In the slides under the microscopes, there is a specimen of cancer of the liver, in which the invading cells present marked resemblance to the cells of the mammary gland at an early stage of its development. It might be supposed, and in this case the supposition would be well based, that the patient suffered from a mammary cancer, and that the cells from the mammary gland were carried, either by the blood or by some other channel, to the liver. Cancer of the stomach often is the original site of a tumor, whose cells may be carried to the liver, or to the brain, or indeed to almost any other place in the body.

The cancer owes much of its malignancy to its rapid growth, and to this power which it has, through its own lack of a wall, and to the thinness of the walls of the blood vessels, of causing metastatic growths. Another cause for its intensely malignant effect is due to the fact that the rapid metabolism which these cells undergo causes the formation of great amounts of katabolic products,—that is, of wastes of cell growth. These must be drained into the blood and lymph channels of the body, and finally eliminated from the body, if at all, by the action of the kidneys, the lungs, and the other organs of elimination. The increased burden thus put upon these organs is sometimes greater than they can bear, and the body is poisoned as well as partly starved.

Tumors which are based upon the type of growth of the embryonic glands,—carcinomas,—have yet another method of destruction. They are essentially glandular, and they seem to produce substances representing a modified secretion. These tumors are not provided with ducts, and the products of their activities are thrown directly into the blood and lymph of the body. Very serious toxic influences may thus be produced upon the entire body, and to these toxins much of cachexia associated with carcinomatous growths is due.

As the cords of the cancer cells push into the neighboring normal tissues, they cause inflammatory reactions of varying intensity. The ordinary inflammatory phenomena may cause great formation of connective tissue, and further growth of the tumor may thus be delayed to a certain extent. It is in this manner that the capsule of the benign tumors is formed, and the process is practically the same as that by means of which the capsule is formed in tubercular reactions—the wall of the tubercle is formed much in the same manner. In malignant growths, however, this scar-like formation may be invaded by the outgrowing cancer cells, and in this way the scirrhous type of cancer is formed. Various combinations of adult connective tissue and embryonic connective tissue, or epithelial or glandular tissues, are thus produced.

One result of the inflammatory process is the formation of "giant cells." These are found in abundance around the edges of the more malignant cancers, and their origin and their function has long been a mystery. They are supposed by some investigators to be evidences of great malignancy, and to be themselves harmful. This may be the case. But on the other hand they often appear to contain within their own bodies cancer cells. It has been supposed that this is due to the fact that the cancer cells have invaded and attacked the giant cells. But I think that if you will study the slides under the microscopes especially you will find that this tissue shows the cancer cells which are within the giant cells to present various signs of injury. They do not stain well; their protoplasm is vacuolated; their cell outlines are irregular and vague; indeed, they appear as if they were being digested. On the other hand, the giant cells which contain the cancer cells do not show any particular evidences of disturbed physiological activities. It is true that some,—very many, in fact,— of the giant cells are over-filled with cancer cells, and that these often appear to be in a dying condition. About the same thing can be said of the phagocytes of the blood,—they may often be found over-filled and dying, with their bodies containing great numbers of bacteria which they have eaten, and whose ingestion is probably of so great influence in protecting the body from infections. It is also true that the phagocytes are found in greatly increased numbers in the neighborhood of infectious agents, and especially of such infectious agents as have marked virulence, so that in the case of the giant cells we have an appearance which in many ways suggests the manner of action of the phagocytes.

This may not be a correct view,—I certainly should not wish to draw any decided conclusions from the study of the few dozen slides which I have been able to study with any great degree of care; but so far as I can now see, it appears to me to be very probable, to say the least, that these giant cells are indeed friends of the body; that they are derived from the endothelium of the capillaries and perhaps from other cellular elements of the body, and that they protect the body, as far as they are able, from the invaders by eating up and digesting the cancer cells.

APPENDIX III.

*DEATH IN PULMONARY TUBERCULOSIS.

I am enabled to present the following report through the kindness of the secretary of the clinic:

The clinic records of the Pacific College show eleven deaths from simple or complicated pulmonary tuberculosis.

Three of these patients appeared to be in the earlier stages of the disease. One patient had been seriously disappointed in certain expectations, one suffered unhappy family relations, the family of another failed to recognize the severity of the condition; as a result of these conditions, the directions in regard to food, rest, fresh air, etc., were disobeyed, the treatments were not regularly given, and the improvement which might be expected did not appear. Death occurred within the year in each case.

Three patients came to this climate for relief. All appeared to be in the later stages of the disease, and in each case the prognosis was grave. These patients followed all instructions obediently, received the treatment outlined regularly, and appeared to be on the road to as complete a recovery as the conditions permitted. They returned to their homes in more severe climates, became suddenly worse, and died within a few weeks of the relapse.

Five patients appeared to be ready to die when the first examination was made. In one case the condition was complicated by a dilated stomach, a mitral regurgitation, and a pronounced melancholia. In another the bacilli of tuberculosis were found in the blood; practically every organ of the body gave evidence of tubercular involvement. An aortic stenosis was present in another case. All died within a few weeks of the first examination. In these cases the care given the patients relieved the most distressing symptoms, and death was easy in each case.

In these five cases, death appeared to be inevitable at the first examination; at least three, and probably all six, of the other patients should have been saved to a fairly long and useful life.

*A. O. A. Jour., May, 1913.

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