tell whether the trouble is in his environment, heredity or disease. While the beauty and the interest of the mathematical demonstration appeal to me, nothing appeals more forcibly than the importance of the measurement itself from a practical standpoint to be used every day by the physician.

DR. H. S. DRAYTON, New York City—I consider the work of the anthropologists and ethnologists, especially their custom of measuring brains and skulls, as vastly inferior to the method illustrated by Dr. Hall. Taking 150 or more crania of different races, measuring them by tape line and calipers in certain regions, and then striking a general average by dividing the aggregate measurements by the number of specimens, has been a procedure that scientific men appeared to be well satisfied with. This modern method, however, with its mathematical accuracy and differential applications, as shown us by Dr. Hall, demonstrates very definitely the crudity of old procedures, and discounts their statistical value.

DR. HALL, in reply—I think possibly I did not emphasize sufficiently that the whole object of this method is to accomplish what Professor Madden had in mind—the application of it by the men who are in position to collect large masses of data for statistical tables—showing in tabular form the evaluations for various groups of individuals, these to be published for the use of medical school examiners over the country. We are now in possession of considerable data, but we are only in the beginning because there has not been enough accurate and scientific grouping done. The average of 20,000 St. Louis children does not signify very much. The children should have been grouped first in various nationalities, and according to social conditions, besides being grouped according to ages. We want the practical application and not the theoretical.

THE EDUCATION OF THE DEGENERATE.*

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Those nerve cells which are most active, develop most in increasing length and complexity of their dendritic branches. The development takes place during physical as well as mental activity, and the education of one cell group, directly stimulated, leads to the education of more or less remote cell groups, by reason of dendritis contact. No matter, then, whether we reach the brain through the avenues of mental or physical activity, we shall have made a commencement in the education of the child just as soon as we can make him do something. If he be defective in mental development, in the development of the cells of the higher centers of the brain, and it is found that they can not be directly stimulated, then we must try to reach them indirectly, stimulating those of the motor area by muscular exercise. "If we wish to hasten the maturity of the brain, we must decide whether the formation of the myelin sheath can better be hastened by stimulation of the senses and intellectual work, or better, by muscular exercise. The latter way seems the more natural. We must, therefore, to begin with, consolidate the motor nerve paths which develop first, and after that seek to develop the portion of the brain concerned with intellectual work. Modern views show a tendency to confirm what the great philosophers of Greece already recognized, viz., that children ought to begin to read and write only with the tenth year. The conviction is again slowly maturing that our children begin too early, that it is injurious for the development of the brain to be fettered to the school desk when only 5 or 6 years old. The conviction is slowly making its way that no more time should be devoted to intellectual work than to muscular exercise. The modern education of youth, however, resembles more an artificial hot-house culture than a natural training of the human plant."[1] Muscular activity alone develops intelligence, the more complicated and varied the movements, and the greater the period of time over which they are extended—up to the age when development ceases—the better will the individual be educated on his purely mental side. Everyday observation confirms this view. The skilled mechanic of no book learning is generally a man of superior intelligence, a man of accurate judgment, good reasoning powers, and good morals. Here in America the mechanic, native born, has almost always a good, common-school education and is a diligent reader. In England, however, it is not uncommon to find skilled laborers devoid of book learning, yet men of no little intellectual force. The children, too, of such men often display intelligence of a high order and become brilliant scholars. They are, indeed, sometimes pointed out as exceptions to the rules of heredity, by those who fail to see the unity of physical and mental stimuli in brain development.

Often, indeed, some simple muscular movements are all that the unfortunate defective can be taught to carry out; it is the one breach which can be made in the wall which separates him from the ordinary physical and mental activities of mankind; but through this single avenue some development is generally possible. Said Dr. Martin W. Barr,[2] chief of Pennsylvania Training School for Feeble-Minded Children: "The motto of the schools—'We learn by doing; the working hand makes strong the working brain'—shows manual training to be the basis of the scheme of development, varied for each grade to suit the intelligence."

In the Elmira Reformatory equally good results are obtained in reaching the higher centers from the physical side. The defectives are divided into three classes: 1, those who are intellectually weak, but have powers of self-control; 2, those who are bright, but lacking in self-control, and 3, those who are weak, and also lacking in self-control. Great benefit has resulted to them from physical training, especially to those of the second class. Nearly all graduate with sufficient self-control from the manual trades' department to be put into the trades' school. The history of one particular case, No. 6.361, is given. He was a dangerous criminal who was made a good citizen by this system of manual training.

That "Satan can find something still for idle hands to do" is an old saw with a new interest; for we now understand that it is not so much the fault of the idle hands as the undeveloped brain resulting from that idleness. This, then, is our brief upon which we ask that every district school have the apparatus and instructors to educate the physical as well as the mental side of our children; not only for the reason that normal children need the physical education, but because certain defectives, certain incorrigibles may be educated and made useful through muscular activity when all attempts at education through merely mental processes fail.

But the work of our schools should go further than this. Just as it is the physician's duty not only to cure members of a family already afflicted with disease, but to make the conditions such that no others shall contract it, so the teacher shall do what he may to lessen the number of defective members of society; for, after all, where and during what period of life can matters relating to personal hygiene, which has so much to do with

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NOTE: This paper is a part of one chapter of a book which will soon be published under the same title.

insuring a sound body and a sound progeny, be better and more thoroughly inculcated than with the impressionable youth of the common schools? And it is encouraging to note that school men are alive to the importance of this question. Two years ago there came from a man who assumed the right to speak authoritatively on the subject, the edict that our youth were not being properly instructed in regard to the effects of alcohol upon the human system, that it is not a poison as is generally taught, but may, indeed, be the only food remedy which, under certain circumstances, will save life. As the alcohol question is by far the most important factor in the teaching of personal hygiene in our schools, this verdict aroused an enormous amount of discussion. This man went before the assembled school superintendents of the country and made an indirect plea for alcohol, teaching that it was a food and not a poison except when taken in excess. This he has reiterated in the columns of the lay press. So great was his influence that the School Superintendents' Association appointed a committee of seven of their members to inquire into his indictment of anti-alcohol teaching in our schools. It is encouraging to know that this committee utterly repudiated the indictment. Not only this, but they recommended, "that the scope of the investigation be so enlarged as to cover not only the topics already suggested, but the whole field of personal hygiene." This they declared after previously extinguishing the special plea for alcohol as follows: "The question of the supposed food value of alcohol is a technical one for medical—not for chemical—experts to determine and not one which needs to concern the man and woman who are engaged in the work of public instruction of children and youth. For them it is enough to know that its use as a beverage is injurious and that all authorities agree in deprecating the formation of the drinking habit, and in commending all practical efforts, through public instruction, to promote the cause of temperance."

Moreover, schools could greatly contribute toward the study of degeneracy by gathering statistics of all children who attend them. For instance, they could have written, with little trouble, in books prepared for the purpose, each child's status when he entered school. Let them cover such questions as physical development and state of health; whether parents are living and their condition of health; whether any brothers or sisters are dead, ill, or in any way mentally or physically incapacitated; whether the race from which he descends is long or short lived; and, if notably short-lived, what has been the chief cause of death; whether any relatives near or remote were insane, imbecile, tuberculous, syphilitic, or alcoholics; what the occupation and habits of the parents; what their social status; and lastly, what is the child's environment? Knowledge of this kind would be of enormous advantage, not only to the teacher, but to society at large, for each individual would then have a tangible record and any shortcomings on his part in more mature years could be traced to their proper causes and adequately treated.

Very valuable statistics of the social and moral status of the parents of industrial and reformatory school inmates are gathered in England and Scotland by those who are officially appointed to collect contributions from the parents for the inmates. These collectors see the parents in their homes at stated intervals, for a period of years, and learn, as far as it is possible for an outsider to learn, the real character and surroundings of the offender's immediate ancestors. "It was stated by Mr. McDonald, one of those agents, in reply to a question of the Royal Commission, that only 6 per cent. of the children in the industrial schools had homes fit to live in. Mr. McDonald's experience related to the parents of Scotch children; in some parts of England the percentage of parents of respectable character is somewhat higher than Mr. McDonald's estimate."[3] Analysis of fifty parents of the industrial school pupils are given. "In the fifty cases 648 summonses were served—an average of 13 summonses for each person—43 warrants were issued and 94 commitments to prison made out. Of the 94 commitments to prison only 7 were actually imprisoned: 1 served six terms; 1 five terms; 2 three terms, and 1 of them one term of imprisonment."[4] These statistics are valuable as far as they go, but an inquiry into the ancestry for two or three generations back would make them much more valuable in determining the relative influence of heredity and environment as the cause of wrongdoing .

Here, again, we come face to face with these important factors in the production of social defectives. What can be done to check the evils of bad heredity and bad environment? Should man but use the same intelligence in dealing with this question that he displays in the breeding of domestic cattle the question would be promptly solved, so far as heredity is concerned; but he will not—he never will. That sympathy which Mr. Sutherland calls a "natural morality" is opposed to it; the general recognition of "liberty" and man's "natural rights" will never permit it. Indeed, the right to marry, the right to procreate his kind, no matter what his misfortunes may be in the inheritance of a debased mind or body, is a right which society will not infringe until altruism becomes as firmly implanted in the human breast as egoism is now. When the whole race becomes so unselfish, so self-sacrificing, that even its degenerate members recognize the wrong they do to society in propagating their kind, and voluntarily give up this fundamental right, then will improvement by suppressing the birth of defectives be possible. Do you suggest that these be compensated by the state, for giving up their right to marry, that the state shall give them an equivalent in money? If you think such a scheme possible, it is quite likely you underestimate man's procreative desires.

A writer[5] describing the life of the southern mountaineer tells the following anecdote: "I saw a boy once, astride a steer which he had bridled with a rope, barefooted, with his yellow hair sticking from his crownless hat, and in the blubbering ecstacy over the fact that he was no longer under the humiliation of accepting $75 a year from the state. He had proven his sanity by answering one question. 'Do you work in the field?' asked the commissioner. 'Well, ef I didn't,' was the answer, 'thar wouldn't be no work done.' I have always feared, however, that there was another reason for his happiness than balm to his suffering pride. Relieved of the ban of idiocy, he had gained a privilege—unspeakably dear in the mountains—the privilege of matrimony."

A recent writer[6] suggests that the hereditary social defective be gently chloroformed into a more perfect world; but where will you stop? Who is wise enough to say that this is a bad specimen which must be destroyed root and branch, while this, his brother, is not quite so bad, and, therefore, shall live and propagate his kind? Some have advocated mutilation to make procreation impossible. Curiously enough, it is the male only which is to be treated thus. Why the unsexing of the

female for the same cause has not been advised by these writers is not apparent. However, this operation would undoubtedly be as strenuously opposed as death itself.

Not only is such radical legislation as that suggested above never likely to be enacted, but mild, conservative laws, looking to the prevention of fraud in making the marriage contract, are opposed, as we see in the proceedings of various state legislatures every year.

To curtail the production of defectives by actual destruction of those who are so unfortunate as to be born, by mutilation, or by harsh laws, seems, then, practically impossible; we shall act much more wisely if we turn our attention to improving the environment which is the wellspring of so much vicious humanity. Shall we kill the degenerate offspring of the alcoholic, and never lift our hands or voices against the thing which is producing the degeneracy? How much of the sum total of degeneracy would be abolished by the abolition of alcoholic beverages? The question is not easy to answer; but it is entirely safe to say that alcohol is responsible for more degeneracy than all other causes combined.

Speaking again of the parents of pupils in the reformatory schools in England, Morrison[7] says: "As a rule parents who go to prison are hopeless drunkards; the remainder escape by payment of the fines. A large number of the parents are engaged in highly paid employments; in many cases it is not poverty which hinders them from fulfilling their parental duties, it is simply vicious habits of life. At the very least eighty of every hundred of them are addicted to vicious if not criminal, habits; the children came into the world in a polluted moral atmosphere, they are contaminated from the very earliest infancy without being aware of it; and, although their status is normal as far as the number of their parents is concerned, it is in the highest degree abnormal when the character of these parents is taken into consideration."

McKim[8] quotes as follows: "Of all hereditary taints, alcoholism is undeniably the most frequent and among criminals it is found almost always alone or in connection with other taints. It is the most common cause of degeneracy, and our prisons are peopled mostly with degenerates or with the children of drunkards. When in the ancestry of any criminal we can not find insanity, or epilepsy, or hysteria, we shall find nine times out of ten that alcohol has been the cause of all the trouble. The other taints may often skip a generation, but this is rarely the case with alcoholism. Alcohol is a poison that pardons not."

But what need to pile up evidence to prove the responsibility of alcohol as the chief factor in the production of degeneracy? The evidence is endless. It may be found on every hand. Look to the defective individuals in your own neighborhood; are they not the children of alcoholic parents, of an alcoholic father, at least? The one imbecile in my own vicinity is the son of a one-time alcoholic father. His coming cured the father of his vicious appetite; but what a price to pay! A young woman who has two score of babies to care for in a kindergarten tells me of a case of alcoholic stupidity in the person of a little lad, the offspring of a beer-drunken father and mother. He sits for hours, seeing nothing, doing nothing, apparently conscious of nothing. She has as yet been unable to arouse him to any kind of activity. This young woman was one of a class to listen to a few talks on the subject of exhaustion in children; and the keen interest she takes in this subject of inherited weakness in the children of alcoholics shows how much good could be accomplished by giving instructions of this kind to teachers.

Start wheresoever you will in the study of this subject of dealing with the hereditary criminal, with the incorrigible, with the defective of society, and when the evidence is all in, the overwhelming responsibility of alcohol stands out as the greatest, most important factor of degeneracy. If you are honest with yourself, no matter what your personal prejudices may be, you will accept this conclusion, for the evidence warrants it. The fight against degeneracy is a fight against alcohol; for let us remove this cause, because it is the most tangible and can be removed if we but will do so, and we shall see that our work is well towards completion.

Where the child is uncontaminated by heredity, viciousness is easily cured. A simple removal from evil surroundings is all that is needed to make good instruction immediately effective. Let the child be well fed; let him be properly clothed; let him have an abundance of room to move about, preferably a large field with forest, lake and stream near by, insuring an abundance of fresh air and exercise. Are not these ideal conditions for a proper education? Let the teacher, in co-operation with parent or guardian and physician, determine through what avenue the child's brain may best be reached to begin cell development, and let that avenue be chosen as the most available to reach the highest degree of development, the most useful education of which he is capable. When the degree of faulty development is such that it is not proper or profitable to deal with him in company with his more normal fellows, the child should be removed to an institution whose particular function is the education of defectives of his class. It is only with those who are faulty in a minor degree that we speak here; those who give much trouble accomplish little in the common schools, and are liable to become criminal in more mature years from lack of proper handling in the common schools. Let the school be a real "brain conditioning house," and do not urge the boy, do not irritate him with the, to him, detestable intricacies of Latin grammar, if he has a love for chemical experiments, for planting things and watching them grow, or for making things with saw and plane; do not blight his love for the free outdoor life of a herdsman or a farmer, to make a poor lawyer or a worse minister. Let there be teachers enough to give the pupils individual attention, and let the teachers be wise enough to see all the differences in the characters developed. No teacher can properly supervise the instruction of more than ten pupils. It is poor economy to put fifty or sixty or more pupils under the care of a single instructor. Their characters will never be known; their hopes, their aims, their ambitions, their secret desires, the knowledge of which is so important to insure the best results—the knowledge, indeed, of which is so absolutely necessary if the school is to be in fact a "brain conditioning house"—can not be known to him. Moreover, the instructor should constantly have in mind the child's heredity, what has been the mental and physical bias of his ancestors, and this he can not do when he has half a hundred or more to deal with. Nor is it possible for him to impress his own individuality upon so many. What the teacher actually is, what the pupils know him to be, what his ideals are and how closely he lives up to them, are matters of prime importance to pupils in this their imitative age; but the teacher's personality loses its force in direct ratio to the number among which it is distributed.

While the utmost freedom should be granted to defectives at school, they should nevertheless be held strictly accountable for their conduct. Less, very much less, should be forgiven in their conduct than in the con-

duct of the normal child. There is, on the contrary, a disposition in society to regard the offenses of these not as faults, but as symptoms of disease, to be condoned and forgiven on the ground of hereditary lack of self-control. Nothing could be more mischievous. One of the first things one of this class needs to learn, is that because of this lack of self-control he must be the more careful to avoid all occasion for giving offense through committing a wrong act. Once let him understand that he is regarded as the unfortunate victim of circumstances, and he will cast all self-control and efforts at self-control to the winds at once, yielding wholly to his vicious impulses. A youth of this kind under the author's care for a number of months improved in his conduct as soon as he was given to understand that he would be held strictly accountable for what he did. He had an alcoholic relative whose irresponsibility he had often heard asserted by a medical man, and drew the natural inference that when he, too, did wrong it was the disease and not himself that was at fault.

CONCLUSIONS.

Finally, the writer wishes to say a few words for the sake of emphasizing some of the propositions stated in this paper. They are these: Education is not merely the imprinting, the photographing of ideas upon the cells of the brain; it is a definite, biologic process, attended by development of the cells in a tangible way, the increasing of their bulk, the increasing of the number, length and complexity of their dendritic fibers, and that the brain which has the most cells thus developed, in all of its parts, belongs to the best, most widely educated individual. Man is born with many millions of cells which never become educated, which remain in the embryonic state, without axis cylinder and without dendrites. Certain individuals are born with deficient cell development, constituting them social defectives, degenerates, incorrigibles, criminals by heredity. The problem of reforming these is to bring about such cell development as will give them the normal individual's sense of right, the normal ethical sense, as will give them sufficient power to control their vicious impulses, and make proper conduct possible. The education of any group of cells leads to the development, though in a less degree, of all cells with which these come in contact; so that if the individual may be taught nothing more than a few muscular movements, at first, those will assist him in obtaining a more general education.

Heredity is the most potent influence in determining the characteristics of the individual. Degenerate ancestors can not produce sound, healthy progeny. Next to heredity, environment is the most potent influence determining conduct; because man, especially in his youth, is imitative in the highest degree. Degenerative changes in the individual of one generation, caused by the habits of a vicious environment, are transmitted by heredity to the progeny of the subject of acquired degeneracy Here they become a permanent heritage. Removing lesser degenerates from a vicious environment may so far restore them to the normal condition as to eliminate the degeneracy in the course of generations.

As it is not likely that heredity will ever be controlled by society through legislative enactment or otherwise, all efforts at eliminating degeneracy must be directed through two channels—education and change of environment.

In education the value of physical training must be recognized as equally important with or more important than mental training. Indeed, physical training must be regarded as the sole avenue, in many cases, through which the undeveloped brain cells may be reached; and, under all circumstances, cell development, through coordinated muscular movements, should go hand in hand with development through purely psychic channels.

As alcohol is admitted, by all competent authorities, to be the cause of by far the greater part of degeneracy, incorrigibility, criminality, the first step toward eliminating these conditions should be directed against the drinking of alcoholic beverages. The ninety million gallons, or more, of alcohol consumed annually by the people of our country, destroys more brain cells, produces more defectives and criminals than many times all other causes combined.

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DISCUSSION.

DR. WINFIELD S. HALL, Chicago—It has been clearly demonstrated in this country that the mental development can be very greatly modified through physical development. In the case of the more pronounced examples of arrested development both mind and body are involved. In all such cases a successful result is reached only through the avenue of physical development. Hence physical development is absolutely essential and, in fact, must precede mental development in all cases of arrested development. Even in a normal child I believe that physical development is an essential preliminary to the broadest and most liberal mental development. Statistics all over this country and England show that to be the case. Another point is the influence of alcoholic heredity on these degenerates. It has been shown that a vast majority of the degenerates are from parents one or both of whom are addicted to the use of alcoholic beverages. This has been shown over and over again in the work at the Elmira Institute. These two points are as firmly established on statistical bases as any two facts in the whole realm of statistics.

DR. H. S. DRAYTON, New York City—I think the term "degeneracy" covers a broad margin of defect. We go among those who have to do with the insane and find a great variety of opinion as to what constitutes insanity. So broad indeed is the margin in which unbalance of mind exists that most people—I do not include the present audience, of course—appear to have some of the elements of "degeneracy" in their organisms. Dana wrote a paper on the topic and said that the stigmata of degeneracy were very broadly distributed. The Lombroso school describes some 30 or 40 somatic features that point to psychic defect. Should we try ourselves by these it strikes me that few of us would pass an examination. As to the influence of education on degeneracy it strikes me that experiments made in different institutions of this country and Europe tend to show that scarcely any young person can be found who is not susceptible of improvement to a considerable degree. This fact was emphasized by an experiment made at the Perkins' Institution for the Blind near Boston when under the management of Dr. Samuel G. Howe. An assistant to Dr. Howe tried an experiment with an idiot—a boy so low in sense defect as to be called "the oyster." In whatever posture he was placed he would lie until moved. He seemed without sense or sensibility. The assistant, not knowing what was best to be done, sat down beside that wretched being and read Greek for some hours every day, his idea being to obtain if possible some expression of attention or interest. After reading in this way for some three months he stopped one day and turned away, when he heard a semi-grunt, the first indication of anything like attention. Later, the "thing" added a slight movement to the grunt. Dr. Howe was so gratified with the small result that he had the work

continued, and in the course of a year or two "the oyster" was actually trained to be of service to himself and the institution. The incident warrants us in not despairing of improving the state of average "degenerates."

DR. JAMES PUTNEY, Charleston—I have had some experience in the oversight of the people in our county workhouse, and on inquiring into the cause of the conditions I have very frequently learned that the parents or grandparents of the subjects were drunkards. Most of the fathers or grandfathers were drunkards and some of the mothers.

DR. MADDEN, in reply—Of great importance is the so-called "crossed education" in which Professor Scripture of Yale University has shown that teaching one hand to become dexterous, rapid and strong, a large percentage of the same kind of education is given to the other hand although it may not be used at all. Not only this, but if a certain number of muscular movements be carried out with the one hand we may instruct the other hand to this same work in 30 to 40 per cent. of the time required to instruct the first hand. It has been found too, that not only when one arm was exercised did it increase in size, but also the other arm increased in size although it was not exercised. I believe we come nearer to appreciating what an education is when we look at it from a biological standpoint and we say that giving an education consists in developing the nerve cells, giving to them axis cylinders and dendrites, and the more dendrites the better the education, from the biologist's standpoint.

As to what is degeneracy, I think the word is very much overworked. When a man ceases to act in harmony with his environment and his conduct is not in accordance with the best interests of society, and does this through some defect in his nervous organization, especially if the fault is congenital, he is termed a degenerate. Our living in the midst of an evil environment may be constantly acting out of harmony with it in doing good. Of course, such a one would not be called a degenerate. One inheriting a vast fortune might be possessed with an altruistic notion that it was his duty to give it away, and in its disposal he might exhibit many eccentricities; still he would hardly be called a degenerate, so long as his acts contributed to the happiness of others. In spite of the fact that he might show an abnormal nervous make-up, it is very likely that he would be called a philanthropist. If a beggar applying to such a philanthropist for alms, in being refused should knock the eccentric philanthropist down, the latter would stand a chance of being called a degenerate. It is not so easy to define a degenerate; we recognize him much easier than we define him.

THERAPEUTIC INDICATIONS SUGGESTED BY THE CONDITION OF THE BLOOD.*

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We are in the age when a better understanding of pathology and bacteriology has shown the absurdity of many pseudospecifics and of symptomatic treatment. We realize more and more the "phusis" of Hippocrates, the "archeus" of Paracelsus, the "pneuma" of Hoffmann, the "anima" of Stahl, and the "vis medicatrix naturæ" of later writers, which power Hahnemann so well demonstrated with his multiple dilutions of nothing, allowing disease to recover without interference. Also, we recognize the uselessness of attempting to cure or even to stay organic disintegration or obliteration.

While acknowledging the above, I think we have become too pessimistic therapeutically, and while we are directing our energies and remedial agents to the etiology and pathology of disease, we have forgotten to better, or correct, or aid the normal metabolism of the body.

Too many books on practice and too many teachers instruct carefully in the etiology, pathology, symptomatology, diagnosis, and prognosis of a disease and then briefly delineate a specific treatment, or say there is no treatment of any avail. The student thus learns to treat the disease by name only and does not treat the disease plus the individual who has it. Thus it is that many an unscientific practitioner of to-day, treating the patient and not making or caring to know the diagnosis in a doubtful case, continues to be in as great or greater demand than the physician who carefully makes the diagnosis, scientifically treats the disease, but forgets the man who has the disease.

Rather than ramble over the list of functions of the whole man, I propose to limit my remarks to a consideration of the blood, believing that in it may lie the wavering balance as to whether the patient survives or succumbs to a disease.

We can not properly treat any diseased organ or disturbed function unless we first know the physiology of that organ, and then the pathology of the disease or condition, the symptoms and signs showing us the degree to which this pathology has extended and giving us the prognosis for our treatment. Next, we must know the etiology to remove it if we can. The plan of treatment thus reached is rational and scientific, but in initiating it and carrying out such treatment it will often not be successful and will rarely be Asclepiades' *"tuto, cito, et jecunde curare"* unless it is modified to fit the man himself.

I trust I may be pardoned if for a moment I speak of the physiology of the blood. The gross constituents of the blood, viz., the plasma and its contained gases, the red corpuscles and the white corpuscles, have normally a certain slightly variable relationship to each other, and how easy it is for this relationship to become abnormal and react to the disadvantage of the whole life process.

While the specific gravity of the blood has a wide range of from 1040 to 1070, variations beyond these limits may have a wider significance and influence than we have previously considered. A much more variable property of the blood is its alkalinity, which is so readily increased by food and so constantly lessened by muscular exertion.

The range of from four to five millions of red blood corpuscles per cubic millimeter varies physiologically with the nutrition, the manner of life, and with age. The physiological diminution after meals is probably due to the destruction of the red corpuscles for the production of the bile pigment, while the decreased number of red cells in females during menstruation is probably due to the direct loss.

In normal conditions transportation to a more rarefied atmosphere will increase the number of red cells, showing that there is a surplus of red cells lying somewhere ready to be poured into the blood stream if there is a demand for them.

Studying the red corpuscles from a clinical and a diagnostic standpoint, we must take into consideration the osmosis that takes place through the stroma of the red cell, as we know that when they are large and well rounded the blood plasma is of low specific gravity. On the contrary, if these cells are shriveled and crenated we know that the plasma is concentrated and of high specific gravity. A large number of nucleated red blood corpuscles, except in embryonic life, shows that there is

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