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HEREDITARY DISEASE.

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In the history of medicine there is no department in which a greater advance has been made than in a better knowledge of the nature and causes of disease; and there is no term employed in medical science, the meaning of which it is so important to have clear and definite ideas of, as that of disease. The most concise definitions given by different writers are, "deranged function and alteration of structure;" "any deviation from health in structure or function causing pain and uneasiness;" "any state of a living body in which the natural functions of the organs are interrupted or disturbed."

One of the most popular English writers on medicine gives this general definition,—“disease is but a deviation from the state of health, consisting for the most part in a change in the properties or structure of any tissue or organ, which renders such tissue or organ unfit for the performance of its actions or functions according to the law of the healthy frame.” It would seem by these definitions that in order to have accurate and distinct ideas of the nature of disease, we must have some knowledge of its opposite state, viz., *health*. This term is variously defined. In a general sense it is “that of a body in which all the natural functions are performed with regularity and harmony.” But then, if we are guided by the common use of the word health, we find it applied in such a variety of ways that it implies a difference in health; and many include only certain parts of the body. In fact, the word is used so vaguely, or with such latitude, that it is difficult to define it satisfactorily.

Thus, while in one sense the terms disease and health are antagonistic, they also have a relative meaning, signifying that there are grades or degrees to each, with lines radiating at times from each other, and again approximating so near together that it becomes difficult to distinguish any border ground between them. But in the case of disease, there is this seeming advantage, that we can the more readily single out the particular tissue or organ affected; when the question naturally arises, what is the cause of disturbance or derangement? Hence, in order to understand the nature or character of a disease, it becomes necessary to investigate its cause or causes. Thus the meaning of the two terms, health and disease, for a full understanding, cannot be well separated.

The results of investigation in this direction constitute an important department in pathology, which, in a short period, comparatively, has added very valuable knowledge to medical science. One of the most popular writers upon this subject recently made the following remark:—"Advances in the science of medicine in future years will be mainly due to a better knowledge of the cause of disease; and just in proportion as our knowledge of physiology and pathology becomes more exact and extended, so will the causes of disease be better appreciated, and its occurrence on a large scale be more readily prevented." A search in the same direction led Dr. John Forbes, perhaps the greatest modern reformer in medicine, to say, "here the surest and most glorious triumphs of medical science are achieving and are to be achieved." This remark was made twenty years ago, and, since that period, the record of improvement and discovery in pathological researches has been crowded with triumphs. The field is still open, and nature invites all inquirers after truth to push their investigations farther and farther.

With the hope of contributing something to science in this direction, we propose to consider in the present paper a distinct class of diseases, with reference more particularly to their cause than to their nature. We refer to that class called *hereditary*—those that are inherited, or said to be transmitted by the laws of hereditary descent. And for the sake of convenience in the discussion, these diseases will be divided into three classes,—

1st. The class that are well known as congenital and abnormal in structure.

2nd class, where the seed or germs of disease are transmitted, requiring only time or occasion to be developed.

3rd class, where the organization itself in its development is such that, under certain circumstances, or exposed to certain influences, diseases of structure or function will inevitably be generated.

The fact that there is a class known as hereditary diseases, is admitted, we believe, by all writers on medical science. In the early history of Greece and Rome, we find frequent reference by different writers to the resemblance between children and parent, but only occasionally is any allusion made to the fact *that* diseases also were thus transmitted. The more prominent writers referring to this subject were Tacitus, Horace, Lucretius, Aristotle, Hippocrates, and Aretæus; and among those of more modern times are Boorhaave, Cullen, Prichard, Lucas, Portal, and Mercatus. Near the close of the last century a new era was introduced in the study of medicine; that was, to obtain by dissection and observation a correct knowledge of the anatomy of the body in a diseased state. Bichat took the lead in this great reform, and is therefore justly styled the father of pathological anatomy. Since that time the study of pathology has been prosecuted with very great success.

While writers have generally admitted hereditary agency as a most fruitful source of disease, there has been some difference of opinion as to what particular diseases originate from this cause, as well as to just what extent this agency exercises an influence. One fact is very patent; that is, the individuals who have given the most time and attention to this inquiry urge its importance most, and assert that this agency in the production of disease is far more powerful than is generally supposed. Statements expressing this opinion might be cited, or quoted from numerous writers, but one must suffice for the present. Sir Henry Holland, now president of the Royal Society, says:—“We can scarcely name any organ of importance which does not afford evidence of diseased actions derived from structure and transmissible by descent. The subject is one that meets us in practice at every step, and to which our attention is perpetually required as an exponent of symptoms; as affording some of the most certain means of prognosis; and as directing us in many particulars to the right course of treatment. No judicious phys-

ician will neglect the resources hence derived, which are in truth essential to sound and successful practice. *It is probable they will be largely augmented in future both by more exact and ample observation of facts, and by the extension of our knowledge of principles in this remarkable branch of physiology.*" This last sentence we italicize, inasmuch as it intimates so positively that some new principles would be evolved from physiology which might greatly extend our knowledge.

While the causes of disease have been for a long time most thoroughly investigated in every possible direction, and our knowledge has thus been much enlarged, very little new light has been shed upon *hereditary causes*, or influences. The difficulty, as we apprehend, is that the laws of hereditary descent have not been correctly understood or well-defined. Some writers seem to have regarded the reproduction of the species, as an agency in causing disease, to be enveloped in so much mystery, that but little knowledge of pathology could be obtained from this source by any amount of study or observation. Others have been more hopeful—have closely questioned nature from different points of view; have, in a multitude of instances, traced out the sources of or predispositions to disease from children to parents, as well as physical weaknesses and defects resulting in disease, and which many have extended through several generations. There are still others who have undertaken to define or expound the laws of inheritance by mapping out distinct portions of the body, and establishing a theory upon a too partial or limited view of nature.

We believe, however, that there is founded in nature an universal law of propagation, upon which the laws of inheritance are based, subject to certain conditions; and that when these laws are correctly interpreted we shall be able to ascertain the real causes or primary sources of many diseases far better than we now do. This law applies not only to the human race, but extends throughout the whole animal and vegetable kingdoms. We will here state our understanding of this law briefly, noticing particularly its relations to hereditary diseases, without attempting to present any proof or illustration of its truth, which would require a volume to do anything like justice to the subject.

This law of propagation is based upon a perfect standard of organization, or consists in the perfectionism of structure and

function ; or, in other words, that every organ in the body should be perfect in structure, and that each should perform its legitimate functions in harmony with others. Taking this, then, as a standard, we have a guide or model by which all changes in organization may be tested. But nowhere in nature do we find perfect standards—only approximations towards them; the deviations being almost endless in variety. As “like begets like,”—here comes in the law of *heredity*, and, as two distinct agents are concerned in the union, the hereditary effects become more varied and complicated. If the organization of both agents or parents was perfect, or was very near alike, we should find the law of likeness or resemblance more generally exemplified in their offspring. But in this union of the sexes the results depend very much upon several conditions, such as age, mutual adaptation, the health, the physical and mental state, etc. There are also some other conditions which modify this law of propagation, such as food, climate, exercise, etc., though these are mostly external, and exert their influence after the birth of the progeny.

It might seem at the first thought, in the blending and mixing up of so many dissimilar qualities, together with the numerous conditions to which they are subject, that weaknesses, defects, or diseases, etc., could not easily be traced from child to parent, or through successive generations. This may be difficult in some cases, but then, in proportion as these abnormalities, deviations, irregularities, or peculiarities are marked or predominant in the organization, they are more or less likely to be transmitted, and, it may be, in an intensified form. If anything abnormal in structure or morbid in function, predisposing to disease, should exist alike in both parents, it becomes generally intensified in the offspring. Thus, if either the nervous or sanguineous temperament is predominant in both parents, that temperament will be very predominant in their children, and will be peculiarly liable to the diseases that generally accompany such an organization.

The question might arise, does this hereditary influence extend to every internal organ, and to every tissue in the system, as well as to outward forms and appearances? It is true, we may not always be able to trace the marked evidences of it, but all the general facts, as well as analogy, look strongly that way, and such is the testimony of those who have investigated most thoroughly this department of physiology.

What relation has this law of propagation and heredity to disease? Most intimate and important, we answer. Unless there are some fixed and settled principles that govern the propagation of the species, and determine just the kind and character of organization transmitted, how can we trace far back the precise causes of certain diseases, or estimate properly the extent of hereditary influences? This law constitutes a kind of key to unlock in nature what would otherwise be obscure and mysterious. It is to the inquirer after truth in hereditary pathology what the chart and compass are to the mariner at sea, sailing along a comparatively unknown coast. In considering this law of inheritance, it may be more convenient to notice at first those hereditary effects that are the most obvious. These we place in the first class. They are termed, sometimes, in books, *congenital*; are abnormalities in structure; some of them would not come strictly under the head of disease, while others would; and most of them induce or lead to diseases of the gravest kind.

We have deformities of the body in size and proportion: giants, dwarfs, additional parts, as fingers and toes; we have deformed organs and parts, such as club-foot, hare-lip, hernia, spina-bifida, hunch-back, strabismus, cataract, hydrocephalus, and other malformations both external and internal.

While it may be difficult and perhaps impossible to trace back many of these abnormalities to their exact primary cause, still, in a large majority of these cases, we think, by careful inquiry and investigation, they can be accounted for either directly or indirectly by hereditary influences. Such abnormalities cannot occur without a cause, though it is impossible for us always to fathom or expose all the secrets of nature, especially when her agency is concealed from our inspection and may be carried on through several generations. Since so large a part of these cases—probably a majority—can be explained as arising from hereditary causes, and as nature knows no exceptions to her laws, the presumption is that all these anomalous cases have an origin from similar sources.

Under this head may also be included what are denominated the *defective classes*, such as the idiotic, the blind, the deaf and dumb, and the insane, as far as their defective organization arises from an hereditary cause. While it may not be possibly to determine just what proportion of each of these classes came

into the world with a defective organization, or simply with a predisposition to these complaints, it is well known in the case of large numbers that the cause of their abnormality has an hereditary origin. And, reasoning from analogy, is there not a strong presumption that the defects or anomalies in many others of these same classes, might, if they could be traced step by step, be referable to the same sources? For all these abnormalities arise from violations of law. If then the great law of propagation is based upon a perfect standard in nature, and the law of inheritance grows out of the changes or deviations from this standard, transmitted from parents to their offspring, how important that these principles be correctly understood, and the consequences, too, of their violation.

2nd Class of Hereditary Diseases.—In this class may be placed those diseases where the seeds or germs are transmitted in a dormant state, requiring only time and occasion to be developed. This may exist in a change of structure, or morbidness of function, or poison in the blood. The class is very large, and we can notice only a few of the more prominent diseases. Taking the lead in this class, particularly in our cities, is *syphilis*, which primarily is communicated in the blood. The very germ of this disease is a most violent poison, and, being transmitted in the blood, it penetrates through every organ and fibre of the system, and may vitiate every secretion. It combines with other diseases, aggravating their form and rendering their treatment more difficult as well as the result more doubtful. There is probable no one disease at the present day so extensive in its sweep, so injurious in its effects, and one which bodes more ill in the future to human welfare. Whatever differences of opinion may exist as to its medical treatment, or as to employing legal means for its suppression, all agree that the germs or the disease are hereditary—a poison in the blood—and may be transmitted through successive generations.

The next disease in order properly in this class is *scrofula*. This may be transmitted in the blood or in the form of tubercle. If we use the term in the widest sense, scrofula would include certain diseases of the skin; also glandular swellings and morbid growths, as well as tubercular deposits, particularly in the lungs. So diversified are the forms in which this disease appears, and so obscure are many of its symptoms, that it is very difficult to

draw the lines between scrofula and some other diseases. But in one thing there is a general agreement of opinion; that is, though the disease is frequently developed and aggravated by secondary causes, yet the poison in the blood or the germs of the disease have their origin, in most cases, from hereditary influences. In confirmation of this statement, the following fact may be cited: In the last report of our State Board of Health, to the question—put to two hundred and ten physicians—“Is consumption caused or promoted by hereditary influences?” only one physician answered in the negative. In this question, the term, “promoted,” may have influenced some in their decision, as there is greater uniformity in the testimony here given than is usually found.

There are several diseases near akin to scrofula that are generally considered to have an hereditary origin, viz., richets, cancer, and malignant tumours. These may occasionally occur from other sources, and are always aggravated by secondary causes. Gout, erysipelas, and rheumatism are classed by many writers under the head of hereditary diseases, though often produced undoubtedly by other causes. The predisposition or diathesis leading to these diseases, are strongly marked in particular families. Chomel, the distinguished writer on pathology, states that more than one-half of the cases of rheumatism may be traced directly to hereditary causes. There are several diseases of the brain that are thought to arise from this source, such as epilepsy, apoplexy, and paralysis. It is a well-established fact that where there is a great predominance of the brain and nerves over the other tissues, a certain class of diseases will uniformly be developed. The same fact may be stated of what is called the sanguine or bilious temperament; certain diseases accompany them. So strongly marked or controlling is the influence between a certain type of organization and class of diseases, that wherever there is found a predominance of one of the temperaments or a certain class of organs, the particular diseases that attack the individual may be predicted beforehand.

With reference to *chronic* diseases, which have been superinduced upon a healthy structure, there may be difference of opinion as to how far they are hereditary in their effects. This may depend much upon circumstances.

There is another question intimately connected with this sub-

ject, viz.: What are the hereditary effects of *habits*? If these habits are of such a nature as to injure the health and impair the constitution, their hereditary influence must be bad; and that, too, in proportion to the injury produced upon the system. For illustrations: The frequent or long-continued use of intoxicating liquors, of narcotics, of stimulants, etc., must injure the health and affect the vital forces, if not taint the blood, so as to implant in the offspring a strong predisposition to the same habits, and the consequent liabilities to disease.

The third class of diseases, or predisposing causes, are peculiar, and require some explanation. All works on pathology dwell or lay great stress upon the predisposing causes to disease—considering the body, in certain cases, is so organized or constituted that diseases will inevitably be generated when the system is exposed to certain exciting or determining influences. This suggests the importance of the great law of propagation, and presents new stand-points for the study of disease and its causes. As this law is based upon a perfectionism of structure and function, it implies that there must be an exact balance in all the organs, and perfect harmony in all their functions. In their normal state each organ has a specific work to do, and in doing that work should not be interfered with or disturbed by any imperfection in the action of other organs. In this case, the “wear and tear,” or the demands which nature makes to support life, and carry on its operations, comes upon all the organs alike. In some respects, the body may be compared to a perfect machine, made up of many very complicated parts. How different is the working or running of such a machine from one imperfectly constructed and unequally balanced in its parts! The one seldom needs repairs; the other, constantly. The one will last, as it were, for an age; the other is entirely used up in a short time. But in the human body we have something more than mere *mechanism*; we have an organized living being, with its most delicate and complicated parts wonderfully exposed; and when once injured they cannot easily be repaired.

Taking this perfect or normal standard of organization whereupon the law of propagation is based, and applying the laws of hereditary descent, we get new and important views of physiology in its relations to disease. We see that wherever there are abnormal developments—where a certain organ, or class of or-

gans, is relatively too large or too small, causing a want of balance or harmony of action in the system, there must be in the very nature of the case far greater liability to disease. And when these abnormal developments are carried to extremes, nature's laws are more frequently violated, and hence arise most fruitful sources of disease. It is in this imperfect, ill-balanced organization where we find not only the greatest amount of sickness, but that which is the most obstinate and fatal. The reasons for such a result are obvious when the true laws of inheritance and disease are taken into account. Now, in no possible way can a thorough or correct knowledge of pathology, in its relations to hereditary influences, be obtained until the true laws of propagation and inheritance are understood, whether those here expounded are the true ones or not. There are three considerations connected with this subject to which special attention should be called:—

1st. The great advantages which a knowledge of those primary laws afford. In the application of all remedial measures, it is of the highest importance to understand, at the out-set, the precise nature and cause of the evil to be removed. And in making up our diagnosis of disease, we should avail ourselves of all the sources or means that can shed any light upon the case. By an application of these principles the peculiar physiology of every patient is more easily understood. We see, readily, the strong and weak points in his organization; what parts or organs are most predisposed to disease, as well as to what particular diseases. Aided by a knowledge of these laws, we can push our inquiries and make our observations in detail to far better advantage. If there are any peculiarities or idiosyncrasies in the constitution of the patient, they are more readily discovered. There is also another feature in organization which it is very necessary to understand in its relations to disease—that is fineness of fibre or quality of texture, and which pertains to the whole system. This fineness of fibre or delicacy of structure has much to do in providing vital forces to resist disease, and it is through the laws of inheritance that we find such differences in organization. This quality pervades not only one organ, but extends to every part of the system, and is transmitted from generation to generation. This kind or type of organization has a far more intimate relation to disease than is generally supposed.

2nd Consideration. In the *treatment* of disease, a knowledge of these laws is of great advantage. Within a few years there has been much discussion as to the relative influence of nature and art in the cure of disease. Once too much reliance was undoubtedly placed in the power of medicine, and it was prescribed in such variety and quantity as to aggravate, if not prolong, disease. In this respect there has been great improvement in medical practice, and, while occasionally too much medicine may now be administered, there is danger of going to the other extreme of dispensing with medicine entirely. What we want is, avoid both extremes; adapt our treatment to the laws of nature; and in order to do this correctly, we must understand not only the nature and laws of disease generally, but the material, the peculiar organization, of every patient; what his temperament is; what are the weak points in his system; what aids and forces his constitution will afford to withstand disease, and assist the means of recovery. The more exact and thorough is our knowledge of individual physiology, the more wisely shall we be enabled to apply all hygienic agencies, as well as medicine, in the treatment of disease. Now by having constantly before the mind a physiological standard, which is normal and perfectly healthy, and then, by carefully surveying the deviations from this standard in the organization of individual patients, we obtain clearer and more definite views of the weak and delicate points in their constitutions, and can thereby better apply our remedial measures. Thus by a more correct and exact knowledge of hereditary predisposition, or, in other words, of the recuperative powers of nature in each individual case, we can make a wiser and more skillful use of the resources of art. As a general thing the most thorough physiologists make the best practitioners of medicine.

3rd Consideration. Perhaps the most concise and practical definition of the object of medicine anywhere to be found was given by a distinguished member of this society, who is now the Nestor in the profession in this city; I refer to Dr. Jacob Biglow. The practical view of medicine, says Dr. B., is this, "it is the art of understanding the nature of diseases so as to comprehend fully their causes; and to prevent their occurrence when possible; also to promote their cure or to relieve them when they do occur." It is the first clause in this definition that claims more

especially our attention. It is such a knowledge of the causes of disease that both the cause and the effect, if possible, can be removed—it is the *prevention* of disease as well as cure. This should certainly be the aim of the profession as much as the mere administration of medicine. And it is a gratifying fact that every year we hear more and more of the importance of sanitary laws and the principles of hygiene. The public at large are beginning to realize more fully than ever the meaning of those trite proverbs that, “a stitch in time saves nine,” and “an ounce of prevention is worth a pound of cure.”

How and where can disease be most effectually prevented, and that too on the largest possible scale? It is not so much, perhaps, by a general diffusion of a knowledge of physiology, as that every individual should understand correctly his own constitutional weaknesses, defects and liabilities, so that he can thereby take better care of himself under all circumstances and exposures. Let him learn early what are his hereditary tendencies, what are constitutionally his weak points, and to what complaints he is most liable. But to do this properly and successfully, the true laws of propagation and inheritance must be better understood. It could not have been intended by the Creator that man should always be ignorant of laws so useful and important.

But there is a wider and more extended view to be taken of this subject than its application to individuals; that is, the prevention of disease upon a large scale. We hear much said of this importance to health of the right kind of food, of good air, of pure water, of proper drainage, of the situation and construction of dwellings, etc. We find almost daily articles discussing these several topics both in newspapers and periodical journals, showing that there is a growing demand for such information. Members of the medical profession and others are pushing their inquiries into every department of science for new means or knowledge whereby disease may be prevented or cured. But there is one source or cause of a great deal of sickness and suffering, more important in many respects and far more reaching in its influence than any of those mentioned, to which comparatively very little attention has as yet been given, that is the want or value of a sound, healthy and well balanced organization at birth. It requires no facts or arguments to show to the

practising physician what a wonderful difference there is in the amount of sickness under almost precisely the same circumstances, between some individuals and families and others; and then how some patients will recover from the most violent and lingering sicknesses, while others die easily from very slight attacks of disease. This difference in vitality arises mainly from the difference not only in the nature, vigor and strength of constitution, but that one patient descended from a sound, long lived and healthy stock, whereas the other inherited the weaknesses and diseases of its parents or ancestors. In every community may be found individuals and families possessing each of these characteristics.

In no one way, in our opinion, can so much sickness and suffering be prevented as in obedience to the laws of inheritance, but, in order to effect any great change in this direction, it must extend through several generations. But how can this improvement be made without a correct knowledge of the laws of propagation and hereditary descent? Unless we have some definite and fixed principles to guide us, how can we here reach any certain and satisfactory result? There must be some fixed laws of this character based upon physiology. Interests of such magnitude, results so important connected with the operations of nature, would never be left to mere chance or accident. All true science is supported by great laws or principles, though they can not all at once be discovered, or be correctly interpreted for ages.

It has been estimated by some writers that full one-third of all the sickness that now afflict society might be prevented by a wise and intelligent application of the principles of hygiene. Now if the physiological requisitions for entering the marriage relation were heeded as they should be, both by man and woman, the predispositions to, or germs of, disease would be diminished to a most surprising extent. Let these requisitions be faithfully adhered to through several generations, and it would be difficult to conceive or estimate what an immense difference it would make in the amount of sickness and mortality.

By applying sanitary laws in the matter of ventilation, drainage, pure water, etc., we only cut off some of the branches of this upas tree, but by strictly obeying hereditary laws we eradicate or destroy the roots of disease. It is much easier to dry up

the springs or cleanse the fountain than to purify large flowing streams filled with poisonous feculence.

It may be said, if the views here expressed of disease should be practically carried out, it would most seriously affect the business and the interests of the medical profession. We admit the truth of such remarks, but, in behalf of humanity, as well as in obedience to the laws of the Creator, we would gracefully submit. It would afford occasion for the profession to act from purer motives and upon a far higher plain of observation.

As society is now constituted there is one standpoint from which a view may be taken of our duties that is not very ennobling. It is this: That so much of our time, thought and labor are expended upon those constitutionally puny, feeble, diseased and sickly for the sake of preserving life, when these very individuals, if may be, will transmit to posterity the seeds of still more weakness, disease and suffering. Such a view of the results of our labors is not at all pleasant or gratifying. While, therefore, we attempt to discharge the duties of the passing hour in relieving pain and suffering, let us faithfully expound and apply, as far as possible, the great laws of life and health, in the *prevention* as well as in the cure of disease. And though we may not find our compensation in dollars and cents, it will surely come in the consciousness of having done our duty, and in the end, that our lives have not been spent in vain. About forty years ago a paper was read before this society that startled its members. The idea was broached that there were a class of diseases which medicine could not break up, nor limit their duration, and whose leading symptoms were not safely subject to much control or interference. Inasmuch as these diseases seemed to be governed by certain fixed principles of their own, they were denominated "*self-limited*," a new term in nosology, but most appropriately applied. These views of medicine, differing so materially from what had been generally entertained, were not very kindly received at the time, were thought by some to be extremely ultra, and, by others, to be decidedly erroneous. But in the process of time they were found to be, after all, remarkably correct, that they accorded fully with the laws of pathology, and the trouble in their reception arose from the fact that they happened to be in advance of the state of medical knowledge generally. In the history of science such instances have fre-

quently occurred, but it is seldom where the leader or discoverer has been permitted to see so great a change as in the present case. Whatever may be thought of the views now presented to your consideration, we are confident that time and observation will testify to their truth. We live in a day of progress, of discovery. The course of true science is always advancing, and in due time all her great laws will be vindicated and established upon a sure and enduring foundation.

