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THE PHYSICAL BASIS OF INSANITY AND THE INSANE DIATHESIS.*

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Gentlemen:—Mental phenomena have been looked upon, in all ages and by all peoples, with a very considerable sense of awe and reverence and a very deep appreciation of their intrinsic mysteriousness. When we consider that of all the various forms, existing on this earth, man is the most highly evolved and the most complex, and that the brain is the most highly evolved and complex part of man, we are in a position to realize why it is that the functions of this wonderful organ have withstood for so many hundreds of years the attempts of scientists to classify them under the domain of the operation of natural laws.

It is true that several centuries before Christ a few of those master minds of the early Greek and Roman civilizations had begun to realize the true significance of insanity and had already formulated many valuable precepts for its treatment. A reference to the opinions of Aristotle, Hippocrates, Asclepiades, Cælius Aurelianus and many others, are sufficient to make us pause and marvel at the magnitude and wonderful insight of those minds which could reach conclusions that the results of the scientific progress of centuries have hardly altered.

But the great work which these men had begun was doomed to become as naught. With the fall of the civilizations of which they were the shining lights they and their works were forgotten; and with the plunging of all Europe into the terrible depths of the ignorance and superstition of the Dark Ages all knowledge of science was lost. The human mind, no longer bent upon the elucidation of scientific problems and the discovery of scientific truths, reserved its energies for the creation and support of a thousand petty dogmas and creeds and strained its forces to sustain a corrupt priesthood, backed by an equally corrupt philosophy.

During these Dark Ages the lunatic was looked upon either as a being possessed of some evil spirit, and consequently worthy

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only of the greatest condemnation and most severe treatment, or as one who had directly received the benefits of God by inspiration, and was accordingly worshipped and canonized. We can hardly imagine more thoroughly unfortunate or unscientific ideas, yet for centuries the convictions of the most enlightened people of Europe, regarding insanity, were expressed by such phrases as "demoniacal possession" and "divine inspiration."

Fortunately for us the mind, no matter how serious may be its obstacles, is bound to advance. The Dark Ages came to an end and the enlightening and vivifying influences of the Reformation roused Science from her deep lethargy. Men began once more the pursuit of knowledge, and the advance of science proceeded directly in proportion to the appearance of the spirit of skepticism and the elimination of the element of the supernatural from their methods of research.

The first evidence we have of the redemption of mental science appears in the seventeenth century in England, in the works of Thomas Willis. He was perhaps the first to indicate the intimate relations subsisting between brain and mind. He was followed in Germany and Switzerland by Gall and Spurzheim, who, although on many points greatly in error, did much to further these views. In France, in the latter part of the eighteenth and the beginning of the nineteenth centuries, Pinel, followed by Esquirol, discarded the older views of the inscrutable nature of insanity and instituted great and lasting reforms in the methods of its treatment.

From those days until the present there has been a constant advance in the knowledge of the pathogenesis of insanity; and that advance has been contemporary with the discarding not only of the element of the supernatural but of all metaphysical speculations as to the intrinsic nature of mind as such. The cerebral pathologist no longer allows his ideas to become warped and distorted by an attempt to correlate some fanciful speculations on the operation of an imponderable and immaterial soul with his observations of tissue changes in the brains of the insane. The modern alienist in his studies and investigations never for a moment considers that the outward manifestations of mind have any other than a physical basis, and the dictum "no psychosis without a neurosis" has become his guiding axiom.

As we ascend from the lower portions of the spinal cord to the cerebral cortex we find that the anatomical structure becomes

gradually and progressively more complex, and a study of the functions of the various regions will show a correlative increase in their complexity. That the cortex, anatomically the most complex portion of the nervous system, gives origin to the most complex functions thereof, namely, the manifestations of the mind, is an undoubted fact.

No matter what may be our individual ideas regarding the nature of mind and its relations to the brain, whether we regard it as an entity contemporaneous only with nervous changes, or whether we regard it on the one hand as cause, or on the other hand as effect of these changes, we must acknowledge that for every psychical phenomenon there is a corresponding nervous phenomenon. These facts being admitted, it is readily seen that insanity is nothing more nor less than a symptom-complex of cortical disease. It is here then in the cortex with its almost infinite number of cells and complex nexus of intercommunicating fibres that we must look for those nervous changes which underlie the psychical manifestations of insanity.

Given a series of cases of insanity in its various forms and stages. Do we invariably find, by the means which we have at hand to employ, definite or even indefinite nervous changes in this structure which would explain in whole or part the symptomatic manifestations? No, we do not. And why not?

Here let me call attention to the fact that the complexity of the cortex is not alone due to the arrangement of its cells and the intricateness of its fibres, but in addition to these factors, and more important than either or both of them, it depends upon the molecular structure of its various constituents.

In those cases then, which show no pathological lesions, the changes are such as have occurred in this molecular composition, and are as a rule not capable of demonstration. Such cases are known as functional diseases, but they are no more functional than any others. The pathological changes, although much more minute and inappreciable than in structural diseases, are none the less real. In view of these considerations, I believe that the future progress of psychiatry will be greatly aided by an appeal to the laws of chemolytic cleavage and molecular physics.

Let us look at the structure of the cortex and its relations to insanity from another point of view. Reasoning by analogy we may assume that the growth of the cortex is peripheral, and that

the higher and later acquired functions are relegated to its outer regions. There is thus what might be called a functional lamination, the functions increasing in complexity from within outward. In support of the hypothesis that the most general cause of disease is the absorption from the environment by the tissues of more motion than they can retain with the result of producing disintegration, molecular and subsequently molar, we find that it is the outer regions of the cortex, which are younger and less stably organized, that are first affected, and, correlative with these peripheral changes, the highest and most complex elements of the mind suffer.

This course of events is typically illustrated by the progressive development of melancholia, mania, and terminal dementia. Melancholia would then be the result of disintegration, in part, of the highest cortical regions. The functions of these regions being carried on with difficulty, there results the painful mental state. The office of these higher centres is largely and often essentially inhibitory; therefore, further and deeper disease destroying them would cause the symptoms of mania, these symptoms not being due to an increase in power or capability, but to a removal of inhibitory control. Finally dementia closes the picture, with its deep-seated and destructive tissue changes.

Illusions and hallucinations are in general due to the irregular and erratic reaction of a disordered nervous mechanism to the advent of peripheral or central excitation. Delusions, on the other hand, are secondary changes of a constructive type, but organized on the basis of false premises, and through the intermediation of disordered sense impressions.

The above general conclusions serve to harmonize and explain the more special results which have recently been arrived at by methods of psycho-physical research. Notable among these are the conclusions of W. Bevan Lewis, drawn from an elaborate series of experiments on the reaction time of optic and acoustic stimuli in the various forms of insanity. In harmony with my conclusions above, of the destructive nature of the lesions of insanity, he finds the reaction time is greater in all forms, not only in melancholia and dementia, but also in mania, both acute and chronic. So far as I know, the reaction time and accuracy of the other so-called special senses, notably the muscular, temperature, and pressure senses, together with those of touch, taste and smell, have not as yet been carefully studied among the insane. But I feel convinced

that when they are, and their results systematically reviewed, that they will but add another argument in support of the general propositions laid down in this paper.

Now that we have arrived at what I believe to be tenable hypotheses as to the nature of those physical changes, which underlie the symptomatic manifestations of insanity, let us inquire into the nature of that constitutional condition, which predisposes to the occurrence of these pathological changes.

To begin with there are two great varieties of the insane diathesis, namely, the acquired and the inherited. Every individual is born into this world with a certain greater or less amount of potentiality to develop. According as to whether these developmental forces of the brain are early dissipated by faulty modes of life, or were originally lacking by virtue of some parental defect, we have the acquired or inherited diathesis. As alienists it is the latter form which we most often meet and which presents the most serious and difficult problems relative to treatment.

This condition of the inherited insane diathesis is closely related to idiocy and imbecility. And here let me call attention to the often overlooked distinction between idiocy and imbecility on the one hand, and insanity on the other. In the former states we have a condition of lack of development only; the individual has proceeded to a certain stage and there stopped; whereas in insanity there is actual cortical disease, whether or no it be engrafted upon an already undeveloped brain. Now the inherited insane diathesis is allied to idiocy and imbecility, in just so far as it is the result of lack of development. On the other hand, it is distinguished from idiocy and imbecility, by the fact that the errors of development are much more irregularly distributed, and more often associated with contemporary symptoms of a very high degree of organization, which, however, is always strictly limited in its manifestations to a very small portion of the individual's mental field.

Such a condition of affairs would render the nervous tissues especially prone to disease because here as elsewhere a tissue which is not up to the standard of development is predisposed to degenerate. The molecular structure of the nerve cells, being in unstable equilibrium, is prone to undergo disintegration by the process of chemolytic cleavage on the advent of environmental forces to the complexity of which it is not adjusted.

The acquired diathesis gives origin to similar conditions not apt, however, to be so deep-seated and serious in their results nor so intractable to treatment.

What are the signs and symptoms by which we may recognize these conditions?

First, the mental symptoms are in harmony with our conclusions as to the structure and functions of the cortex. They are notably those of loss of inhibitory control and marked irregularity and lack of coördination in the manifestations of all of the mental faculties. These patients are prone to be unreasonable and illogical, their emotions are unstable, and react to what would normally be insufficient stimuli: they frequently manifest a profound egotism with coexisting absence of the altruistic sense. Owing to the disordered nervous mechanism, we find the incipient stages of delusions which will, in time, become fixed and organized, if they go in the direction of degeneration. Thus we have agoraphobia, claustrophobia, mysophobia, imperative conceptions and frequently, in connection with disordered cœnæsthesis, sexual perversions and beginning derangement of the notion of personality. When these changes are especially localized, or noticeably manifested in particular directions, there occur those conditions known as dipsomania, moral imbecility, etc.

In concurrence with these symptoms of lack of development often occur, as before mentioned, symptoms of a very considerable development along certain lines; and the recent investigations of Cesare Lombroso in Italy have gone far to show the intimate relations maintaining between genius and insanity.

Many of the great reforms which have been instituted in the course of mankind's development have owed their origin to men of this class. Men, who though suffering from neuroses, in some instances even epilepsy, have had brains so highly developed in one particular direction that convinced of the value and correctness of their views they have been enabled to direct the convictions of the people. They might be considered as the products of the social states from which they arose, as abnormal developments in one direction, arising at a time when society was ripe for reform, and only needed their guidance and control to choose and follow the right path.

Unfortunately the manifestations of the insane diathesis do not always take this more desirable course, and a considerable number

of these mentally alienated persons are relegated to the criminal classes. The modern science of criminal anthropology has added greatly to our knowledge of this unfortunate and so long misunderstood class of men. The investigations of Lombroso, Manouvrier, Garofalo, Benedikt, Bertillon, and a host of others have thrown new light upon the phenomena of crime. The criminal is no longer regarded as always and invariably a responsible person, but, on the contrary, as frequently the victim of circumstances, and his crime rather a social than an individual phenomenon.

When the results of the scientific study of the criminal shall have been accepted by the world, let us hope that the disgusting spectacle of a man mounting the gallows to expiate the mistakes of his ancestors and his own faulty cerebral organization shall be forever rendered impossible.

There are many other forms which the insane diathesis assumes, but those to which I have called your attention are by far the most important, and present problems in their consideration which are second to none in weight with which the scientific world has to cope.

It would indeed be surprising if all these mental symptoms could occur as a result of a lack of developmental forces, and there be no signs of this great defect manifest in the other organs of the body. As a matter of fact we find on studying this class of patients that they do manifest various departures from the normal in almost every conceivable direction. These signs are known as the signs of degeneration, and have been exhaustively studied by Morel, Legrain, Broca, Lombroso, Manouvrier, Ottolenghi, and many others. They are especially noticeable as presenting symptoms of irregular and disordered development, and the defective organs present in general atypical and asymmetrical characters rather than definite departures from the normal in particular directions. To be more explicit these signs are asymmetry of the skull, scaphocephalus, plagiocephalus, prognathism, high and narrow palate, asymmetrical innervation of the facial muscles, strabismus, poorly nourished teeth, deficient vitality, vaso-motor disturbances, and a great number of others. Although they vary in significance we cannot say that any one of them is pathognomonic. It is only by their combination that they constitute important evidence.

In reviewing this paper, what are some of the implications

which are of greatest practical importance to the general practitioner of medicine? First and foremost is the conclusion that for each and every manifestation of mental activity, whether it be the fitful flush of an emotional state, or the prolonged and laborious process of reasoning, there is a corresponding and correlated nervous activity.

It is easy enough to recognize those dangerous symptoms of cerebral exhaustion which afflict the over-worked business man, and advise him to leave the worry and work of his office and take a trip abroad. But to recognize those subtle departures from the normal, manifesting themselves in the child, and advise proper methods of education, requires special knowledge and skill. With the rapid advances in psychiatry new responsibilities have been thrust upon the shoulders of the physician, and though he may not possess all the requirements necessary to furnish such advice, he should be able to appreciate in general the signs and symptoms of an abnormal mental state, and refer the parents to a skilled alienist. By so doing very frequently an unlimited amount of suffering and anguish could be spared and an individual who would otherwise end his days in a prison or an asylum be rescued ere it were too late and become a useful member of society.

The physician occupies the same position relative to these questions which he does to so many others. He is a quiet, unostentatious, though constantly working, educator of the people, and I believe that largely through his efforts the laity will in time come to a correct understanding of the evil effects of faulty unions and bad methods of education, and that such knowledge will be employed by them in the application of rational methods of prophylaxis, which after all offers the only satisfactory solution of these problems yet reached.