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**Part I.—Original Articles.**

*The Investigation of Some of the Causes of Insanity.*<sup>(1)</sup>

The Presidential Address at the 84th Annual Meeting of the Medico-Psychological Association of Great Britain and Ireland, held at Birmingham, July 7–10, 1925, by Sir FREDERICK W. MOTT, K.B.E., LL.D., M.D., F.R.C.P., F.R.S., Lecturer on Morbid Psychology, University of Birmingham, and Honorary Director of the Laboratories of the Joint Board of Research for Mental Diseases, Birmingham.

FIFTY years ago, that great pioneer in mental diseases, the late Dr. Henry Maudsley, delivered the Goulstonian Lectures on *Body and Mind*, and he said: "The time has come when the immediate business which lies before anyone who would advance our knowledge of mind, unquestionably is a searching scrutiny of the bodily conditions of its manifestations in health and disease."

No progress was possible in the advancement of our knowledge of mental disease until we had shaken off the spell of metaphysical speculation and the traditional doctrine of the mind as an invisible intangible spirit with a separate existence in the body. We now generally recognize the brain as the seat of the psyche, but the functions of mind are dependent upon the whole body, and the harmonious interaction of all its parts.

The time-worn dictum, *Mens sana in corpore sano*, implies that if the body is healthy, then the mind is healthy, but there are numbers of people who suffer with bodily disease who, nevertheless, have a healthy mind; and again, there are numbers of people who have a disordered or diseased mind, but, so far as we have been able to discover, have a healthy body—for example, various types of neuroses and psychoses, and of moral feeble-mindedness. But because we can, by our present methods of investigation, find no material cause for abnormality, it does not follow that subtle biochemical and biophysical conditions, which are dependent

<sup>(1)</sup> Delivered at the University Buildings, Birmingham, July 7, 1925.

upon inborn functional or bodily defects, are not there. Especially do I refer to the latest structure of evolutionary development—the cerebral cortex. We realize this when a study is made of the action of narcotics upon the brain. In order to act upon the highest levels of the brain weak doses of narcotics are sufficient to affect the intelligence, self-criticism, judgment and control; while lower levels may be unaffected, although the neurons of all levels are of apparently similar structure. The highest level, controlling psychic activity, when subjected to nearly the same conditions as other parts of the nervous system, must, therefore, physico-chemically differ in the fact that it is much more sensitive to poisons. They are the first to undergo the deleterious influence of any form of intoxication, whether the poison arises within the body, as in various forms of auto-toxæmia of deranged metabolism or microbial toxæmia of infectious diseases, or from hetero-toxins—that is, poisons directly introduced into the body, the action of which is proportional to the dose, *e.g.* alcohol. Again, we know that suspension of oxygenation affects this evolutionary level first. This highest level represents the psychic personality of the individual, and is the personal equation,  $x$ , due to the inborn tendencies and characters derived from racial and familial ancestry, near and remote. It is the last to come developmentally and functionally the first to go. It is a fact that primitive people suffer with the same psychoses and psychoneuroses as the most cultured people, but the symptoms, *e.g.*, illusions, hallucinations and delusions, are coloured by social usages, customs and beliefs, of which the furniture of their minds is largely constituted. There may, however, be no macroscopic or microscopic difference in structure of their brains discoverable. Is there any morphological condition which would account for arrest of development of this highest level, as in idiocy, or partial arrest, as in imbecility? We know that in cretinism the arrest of development of the cortical neurons is due to insufficiency of thyroxin—a chemical substance essential for the development of the nervous system and its proper functioning. In the development of the cerebral cortex with its countless millions of neurons from relatively a few protomeric cells of the first cerebral vesicle there may be an arrest of development of many of the cortical neurons owing to a vital germinal deficiency. Again, in the rotation backwards of the developing prosencephalon to cover the thalamencephalon, vascular conditions may arise interfering with the nutrition of the rapidly developing neurons. This latter cause may account for some forms of idiocy when there is no evidence of hereditary taint.

Sir Thomas Clouston, in his Morison Lectures on "The Neuroses

of Development" in 1890, said that one of the objects of his lectures was "to show that the most serious of all the pathological facts of brain development are certain mental disturbances in the function of the brain, and that these are associated hereditarily and functionally with, and take their character from, the function of reproduction, which, during adolescence, is attaining its full strength." Our knowledge of the functions of the reproductive-endocrine system was then only in its infancy, but his practical mind regarding the relation of the physiology and pathology of reproduction to neuroses and psychoses is clearly shown throughout these lectures.

THE CHANGE OF THE MENTAL ATTITUDE OF THE INDIVIDUAL IN ADOLESCENCE AND AT THE INVOLUTIONAL PERIOD.

The change in the mental attitude of the male and female at puberty is shown by conduct in a variety of ways, but the emotions and passions are revealed in a similar manner by gesture language by all people, whether primitive or civilized; it is not surprising, therefore, that the psychoses and neuroses which affect human beings with an inborn neuropathic tendency dependent upon or correlated with disorders of repressed or perverted sex instinct present the same fundamental symptom-complexes in all human beings. But all psychic activities are subordinate to, and dependent upon, physiological processes, and I would put forward the premise that a disintegration of the psychic unity may be conditioned by a disintegration of the physiological unity. The functional correlation of mind and body is shown by the profound influence the reproductive-endocrine system has in the evolution at puberty of the sentiments and passions, which have their roots in the sex instinct. Not only the highest altruistic sentiments of love, pity, and devotion, but the baser self-regarding sentiments, *e.g.*, pride and vanity, arise from the biological instinct of self-display for attracting the opposite sex manifested in savages as well as civilized people by a regard for personal appearance and adornment by dress, ornaments and jewels.

Again, the cause of jealousy is frequently resentment of the loss or suspected loss of the love of another for whom there is a sexual attraction, which may find vent in hatred and vengeance. In the female these sentiments are more prolonged, more contemplative, and are felt more; and because she, unlike the male, is unable herself to react openly, impulsively, and violently upon her rival, the sentiment is generally repressed, causing a mental conflict which may end in a neurosis or psychosis. It is not surprising, therefore, that disappointed love is by no means an uncommon assigned cause of a mental breakdown. But sexual love cannot

be separated from self-love, with which it constantly interacts, and a broken-off engagement, by wounding the *amour propre*, causes shame and humiliation, which the maiden represses and conceals because she expects little real sympathy from her own sex, and not infrequently she fears ridicule or contempt.

In adolescence the natural self-assertiveness of the young animal to become independent and leave its parents to find a mate is shown in the human adolescent by vague longings and desires, while old affections are allowed to lapse ; and this becomes a disturbing mental element, for it is not understood why the affections of parents and family and the home in which they were born and bred no longer satisfy the desires. At first there is an abyss between aspiration and realization, and hopes may be dashed by disillusion, but the normal individual gradually develops his character, his virtues and his vices, and the difference of types of character due to the multiform inborn racial and familial ancestral dispositions becomes more and more clearly pronounced, and should a normal evolution of character not take place, there often results a misunderstanding of the true position of life and failure to grasp realities, which causes disappointment, jealousy, hate and other unhappy traits of character. The individual with this undeveloped character becomes brooding, contemplative and "shut in," and fails to get in touch with the realities of life. This "shut-in" personality may be the first sign of an adolescent neurosis or psychosis.

The function of reproduction stands in a different position from all the other functions of the organism. It arises differently, ceases differently, and it is more affected in character according to the sex of the individual than any other function. It is not entirely dependent upon the individual's sex organs, but upon the functionally correlated endocrine system of glands as well. The sexual desire may exist even after the testes or ovaries have been removed, but it must be remembered that the interstitial glands (Leydig cells) exist in the male embryo before the generative cells come into existence. Having regard to Steinach's experiments, their hormones may determine male sexual characters in all the cells of the body, including the central nervous system.

Steinach castrated male frogs and showed that these animals no longer exhibited the clasp reflex in the breeding season. He showed that injection of testicular extract restored the clasp reflex. Again, he showed that an extract of the nervous system obtained from frogs during the breeding season restored the clasp reflex in the castrated animals. Controls did not give these results. He concluded that the sexual hormone had a special affinity for the nervous system in which it may be stored. Inhibitory impulses arising in the brain lower the spinal reflex excitability, the testicular hormone regulates and controls the nervous mechanism. "How much more complicated must be the physiological behaviour of the Mammal or Man, and one can realize how manifold must be the variations in psycho-sexual behaviour which has arisen on so complex a psychological basis" (Lipschutz).

A regressive atrophy of the interstitial cells occurs after birth, and about the fourth month I have found the seminiferous tubules are twice the size of those at birth, and instead of being separated by loose connective tissue containing abundant Leydig cells, as at birth, the tubules are now closely approximated and the Leydig cells have almost disappeared. They do not reappear until puberty, when the generative function commences; the sexual hormone from the interstitial cells then passes into the circulation and determines the bodily and mental secondary sexual characters.

Seeing that the male sexual hormones are active for about six months in pre-natal and post-natal periods, it follows that this influence has been operating on all the somatic cells, including the nervous system, during that time. And, if there be a selective storage of the sexual hormone in the nervous system, as Steinach's experiments indicate, then a masculine behaviouristic tendency may thus early be engrafted upon the nervous system. Moreover, by its sensitizing influence, the primary male characters are made dominant in all the bi-sexual somatic cells. Castration, even in early life, cannot remove entirely the effect thus early implanted in the nervous system, nor affect the entirely male characters already determined in the tissues; what it can do is to inhibit the appearance of the male *secondary sexual characters*.

There can be no development of sex characters without all the other organs of internal secretion participating; all these glands, and especially the thyroid, the pituitary and the adrenal, we know are influenced by the internal secretion of the sexual glands, and the latter are undoubtedly influenced by the former; indeed there is a harmonious functional interrelation of the reproductive organs and the whole endocrine system. In fact, the interstitial gland may be regarded as a part of the endocrine system of glands; thus, in a case of dystrophia adiposo-genitalis which I have recently investigated, there were infantilism of external genitals and atrophied testes; both interstitial cells and spermatogenic cells were replaced by fibrous tissue and fibroblasts. Associated with this was an atrophied pituitary and an atrophied thyroid gland.

But it may be asked, What about the sexual hormone in the female? It is generally assumed that the source of this is connected with the development of the Graafian follicle. I have found that the ovaries at birth and in early infancy contain numerous immature Graafian follicles. It is generally assumed that the cells of the zona granulosa and the internal thecal cells of the follicle secrete a hormone that determines female characters; it may therefore be supposed that a continuous conversion of primordial follicles into immature Graafian follicles (that subsequently become

atretic follicles—maturation and dehiscence not occurring) is for the purpose of providing a feminizing hormone to counteract the pre-established male dominance. Should this not occur to a normal physiological extent, having regard to the selective storage action of the hormone in the central nervous system as revealed by Steinach's experiments, there would occur, as a result, a tendency to masculination, especially in mental characters.

It will thus be seen that a male or female sexual sensitizing influence is exercised at a very early period of life on all the cells of the body. In the male this influence ceases shortly after birth, and the whole of the somatic cells of male and female are, until the dawn of adolescence, engaged in growth and self-preservation in preparation for reproduction and preservation of the species.

In cases of hermaphroditism both male and female interstitial cells are present owing to the existence either of an ovario-testis or an adrenal tumour in the female, the cortex of the adrenal having, in the course of embryonic development, included testicular interstitial cells. Such tumours may have an influence before birth and cause a combination of male and female external sexual characters—hence the term "hermaphrodite" (*Ἑρμῆς*, Mercury, and *Ἀφροδίτη*, Venus).

But these are extreme cases. There are masculine women and effeminate men; and having regard to the obvious influence of sex hormones in determining psycho-physical characters and conduct in men and animals, the question naturally arises whether a dominance of one or other sexual hormone acting in early life may not lead to these conditions. Thus a failure to form Graafian follicles and the internal secretion in early life would leave the male dominance unchecked.

There is considerable evidence to show that the primitive ovary is hermaphroditic—a view which was confirmed by Kohn as lately as 1920. While the testis develops nearly directly from the undifferentiated original mass, the ovaries pass through a stage in which the cortical part may be considered female, but the deeper or medullary part as male or testicular. There is in the early stages then two factors which influence somatic sex characters. In the majority of cases the male sex hormone completely dominates in the male, and to such a degree that shortly after birth its action is no longer required; whereas in the female the corresponding sex hormone must continue to be formed by Graafian follicles in order to maintain female characters. We can explain, then, women with masculine tendencies by a failure in the development of interstitial cells producing female sex hormones in early life by an inadequate Graafian follicular development. On a similar



hypothesis we can explain effeminate men by supposing that the normal male sex hormone is inadequate to determine complete male sex dominance. Of course that leads up to the question whether sex is determined primarily in the fertilized ovum, as the discoveries of the sex chromosomes appear to indicate, or whether the somatic blastema is asexual, and the determination of each sex development is dependent upon the predominant sexual hormone in pre-natal and post-natal periods of life. This hypothesis of imperfection in sex determination causing masculine women and effeminate men, whereby *chance may lead to habit formation and acquired homosexual tendencies*, which gradually become so firmly installed, fixed and organized as to replace the normal physiological attraction to the opposite sex, is more probable than that there is such a thing as inborn homosexuality.

At puberty there is a reviviscence of the interstitial cells in the male, and their secretion now exercises a sensitizing all-pervading energizing influence upon the whole organism, which continues until the period of the climacteric determines the end of the vital urge or libido in its intensity and power. This "change of life" occurs not only in women, but in the male sex we have to reckon with it and its abnormal transformations, to some extent, even in the senile period of life. It is not sufficiently realized that the climacterium may, in some men, occur between 55 and 65. This may be manifested by a marked mental and bodily change, which in some, but by no means all cases, is associated with arterio-sclerosis. There is a type of neurasthenia and of involuntional melancholia which probably in most cases, and certainly in some, has its origin in testicular retrogression and concomitant endocrine gland changes. The melancholia, and frequently suicidal tendencies, shown by these patients reveals the fact that the *joie de vivre* has ceased.

Mendel speaks of the *climacterium virile* with lack of secretional control and tendency to shed tears, combined with manifest signs of depression, disinclination for exertion, lack of will-power and irritation, other symptoms sometimes prominent being dizziness, sense of pressure in head, hot flushes and palpitations of the heart. It is not infrequent to find a glycosuria in these cases, and its continuance testifies to a permanent disorder of bodily metabolism which may be explained by endocrine deficiency or imbalance; or possibly to hypothalamic changes and resulting functional disorder of the vegetative nervous system, which it controls.

#### THE INBORN CHARACTERS OF MIND.

The furniture of the mind is the memory store of our experiences and the bonds that unite them. The quantity and quality of the

furniture of the mind depends firstly upon the inborn germinal raw material begotten with the body and derived from species, sex, race and ancestry, giving each individual a special predetermined plasticity to receive and store impressions and react to them. This raw material of inheritance upon which psycho-physical energy, durability, educability, imagination, temper, emotivity, moral and æsthetic sense, upon which the personality so largely depends, is inborn. These fundamentals of mind are begotten with the body and predetermine character and conduct, as was clearly proved by Francis Galton that dissimilar twins remained dissimilar in mental and bodily characters when brought up in the same environment, while similar twins brought up in different environment remained similar in mental and bodily characters. This is a convincing proof of the fact that the raw material basis of mind is begotten with the body. If inborn good qualities are deficient or absent there will be, in spite of favourable environment after birth, intellectual, æsthetic or moral feeble-mindedness of various forms and gradations. Again, if there be inherited a disproportion and a lack of harmony and integration of these inborn factors of the raw material upon which mentality is based, an unbalanced mind is likely to develop, which will show itself in various departures in conduct from that of the normal individual; it may be in the form of eccentricity, mysticism, fanaticism or the psychoneuroses, *e.g.*, hysteria, neurasthenia, psychasthenia, epilepsy, megrim, asthma, or the psychoses (the true insanities), amentia, confusional or toxic psychoses, dementia præcox, manic-depressive or periodic insanity, dementia presenilis and involucional melancholia, as distinct from acquired organic brain disease, such as general paralysis. But with this inborn instability of the highest evolutionary level, the study of pedigrees shows there is very frequently creative imagination and genius in arts, literature and science in members of a stock having insanity or epilepsy. Chances or circumstances may have determined the one or the other evidences of the instability. Also many of the most notable personalities in history were either at one time insane or exhibited mental instability and genius. There is truth in the lines of Dryden :

“ Great wits to madness sure are near allied,  
And thin partitions do their walls divide.”

Again, a race, such as the Jews, which has been subjected for eighteen centuries to persecution, affords an instance of natural selection and survival of the fittest, so that only those Jews who were possessed of the highest mental faculties and capacity of making



new adjustments during this long period of adversity have survived. It may be assumed that quickness of apperception and readiness to seize opportunities have developed a high degree of racial plasticity of the cerebral cortex in connection with its evolutionally latest functions associated with the social instinct—an instinct which by natural selection and survival of the fittest in the course of eighteen centuries of persecution has taken on certain specific racial characters admirably described by Nietzsche. But this high degree of plasticity is necessarily associated with a greater liability to mental instability, and I believe this more than intermarriage is responsible for the high percentage of psycho-neuroses and psychoses in Jewish stocks; often, however, this plasticity and instability is associated with genius or great talents in literature, the arts and sciences.

#### NEUROPATHIC AND PSYCHOPATHIC PREDISPOSITION IN RELATION TO PSYCHO-PHYSIOLOGICAL STRESS.

The study of relatives in the London County Asylums by a card system and by the method of systematic inquiry and construction of a large number of pedigrees,<sup>(2)</sup> and the investigation of statistical data relating to the age at onset of insanity in the offspring of insane parents, afford, to my mind, conclusive evidence of three facts in relation to the *causation of mental disease* :

- (1) The importance of a neuropathic and psychopathic heredity.
- (2) The special liability of the neuroses and psychoses to occur in adolescence and the involutinal periods of both male and female sexes when the sexual function matures and wanes.
- (3) The influence of child-bearing and lactation in women acting as exciting causes.

That the inborn predisposition is the most important fact in the development of neuroses and psychoses is also shown by the frequency with which these various psycho-neuroses and psychoses occur at periods when normal physiological changes occur in the body, *e.g.*, adolescence, when the sex instinct is aroused and matures, exciting a new vital urge in the whole body, and the involutinal period when it wanes.

Again pregnancy, parturition and lactation are normal physiological processes of the sex instinct, yet a number of cases of insanity in women designated puerperal mania, or lactation mania, occur as a result of auto-toxæmic stress occasioned by a normal physiological process. Even in cases of septic origin a psychopathic predisposition cannot be always excluded. For many women have puerperal septicæmia, but do not become insane. The term "puerperal mania" is a misnomer in a way, for the cases belong

to three groups: (1) Exhaustion psychosis or toxic psychosis; (2) manic-depressive insanity; and (3) dementia præcox.

(1) The greater the influence of the extrinsic cause, especially if it be pathological, *e.g.*, toxic conditions, the more probable is the recovery by treatment removing the source of the sepsis, and the liability to a recurrence is less.

(2) Emotional shock, worry, anxiety, insomnia and exhaustion are also regarded as important exciting factors of insanity. But the war has shown that these two groups of exciting causes are not of such primary importance as was suspected, for it was observed that there was no great increase of insanity among the women in Galicia and East Prussia when they had to flee on account of the invasion by the Russians in the Great War. Moreover, Bonhöffer found only 5 insane among 10,000 Serbian prisoners who had been subjected to every form of stress and disease.



FIG 1.

(If *E* represents mental and bodily extrinsic factors, and *I* inborn predisposition, the more of *E* that we can find as a causal factor, the more favourable is the prognosis.)

#### STATISTICAL DATA RELATING TO INHERITANCE AND INSANITY IN THE PERIODS OF ADOLESCENCE AND INVOLUTION.

The importance of these physiological states of adolescence and involution in the incidence of the onset of insanity is shown by the two graphs (Figs. 2 and 3) based upon an investigation of the age at the time of first attack in 508 pairs of parent and offspring, from records of 464 insane parents of 500 insane offspring.

These curves in the offspring show 47·8 *per cent.* of 500 offspring who became insane in adolescence at or before the age of 25. These 47·8 *per cent.* of cases of adolescent insanity may be divided into three groups:

(1) Exhaustion psychosis, confusional insanity or amentia, and who were discharged recovered.

(2) Recurrent or manic-depressive insanity, discharged but re-admitted on one or more occasions. As a rule the length of the period of asylum detention increased upon each attack, some cases finally passing on to dementia and detention till death.

(3) Primary dementia of adolescence or dementia præcox. In

the vast majority of cases these were progressive and there was permanent detention till death. These cases make up a large proportion of the chronic cases in asylums.

(4) The imbeciles are relatively few in number, as they are sent to the mental hospitals of the Metropolitan Asylums Board. A few are admitted to the London mental hospitals on account of the onset of acute symptoms. There are also a few cases of juvenile general paralysis, but the great bulk of the cases belong to 1, 2 or 3.

These statistical data were prepared in 1911.

In 1917 I made a further analysis of relatives' cards since 1911, a period of six years. This analysis was limited to insane parents

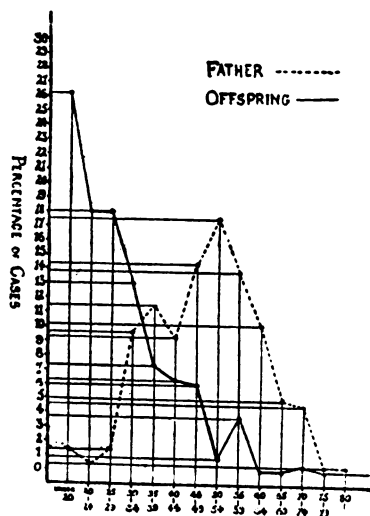


FIG. 2.

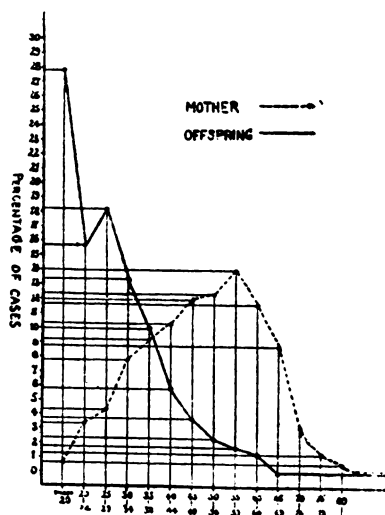


FIG. 3.

of offspring, of which a diagnosis of dementia præcox was made, and instead of 47·8 per cent. there were 75 per cent. of the 69 cases diagnosed as dementia præcox admitted at the age of 25 or under. Seeing that a great many of these cases were either insane before certification or by their conduct had given prodromal evidence of oncoming dementia, it is highly probable that all the cases really commenced in the adolescent period.

Prior to the war the two sexes were about equally represented in the admissions. During the war the male cases of dementia præcox were diminished by one-half. This may easily be accounted for by the fact that a number were conscripted in the early states of mental affection, or the disease developed after their admission to the army. It was found that 14 per cent. of the total insane who served in the army were cases of dementia præcox, which

proves the truth of the assumption I have made in respect to the great fall in the admissions on the male side during the war.

A comparison of the two curves of the parents shows a notable difference. The curve of the fathers does not commence to rise till after 25, and the 30-40 peak corresponds with the incidence of general paralysis of the insane. It may be remarked that males suffering with general paralysis are four to five times as numerous

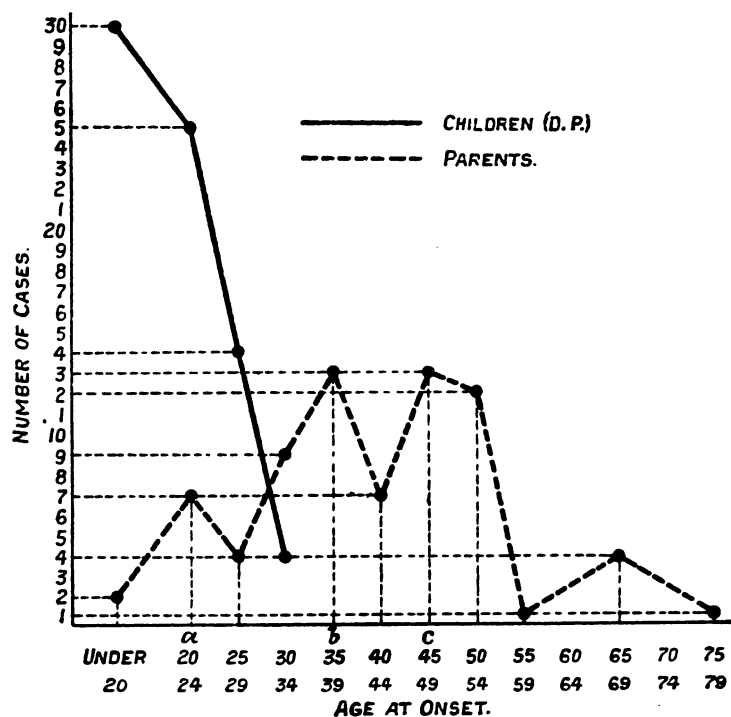


FIG. 4.

as females, but this does not account for the difference in the male and female curves. This difference in the curve of fathers and mothers is due to the incidence of child-bearing and lactation, which causes a steady continuous rise to the climacterium in the maternal curve, the 50-60 peak to the involutional period.

It was also computed that only 7.9 per cent. of the children were born after the first attack of insanity in the parent.

#### RECURRENT INSANITY IN WOMEN AND CHILDBIRTH.

An analysis of 642 female admissions to three London County Council mental hospitals during the year 1911 showed 148 recurrent

cases, of whom 32 (12 *per cent.*) had children between the respective dates of admission. The inference that can be drawn is that rather less than one-fifth of the recurrent cases have children after their first attack of insanity. This may be explained by the adoption of contraceptive methods, but my investigations suggest another important cause, *viz.*, early involucional changes in the ovaries in all the psychoses.

How can we explain manic-depressive insanity? In this disease of the mind we have periods of complete sanity alternating with insanity. This must imply that there was no suppression of function, only temporary suspension of the highest evolutionary levels, and, following the teaching of Hughlings Jackson in his illuminating address, "The Factors of Insanities," we may, using Jackson's own words, look upon "the illusions, hallucinations, delusions, extravagant conduct and abnormal emotional states in an insane person as signs of activity," in what remains intact of the functionally disorganized highest levels. These positive mental states which are regarded as the signs of insanity "imply co-existing negative mental states, defective perception, less reasoning power, less adaptation to present surroundings, and absence of the finest emotions in comparison with the former sane person. To take examples, any illusion implies that a thing is *not* recognized as it would have been before the insanity, and this means that there is a co-existing negative mental element; any delusion implies that the patient does *not* believe as he would have done before he underwent dissolution, and this implies that there is a co-existing negative element."

Alcohol is generally regarded as a stimulant, whereas it is really a narcotic. It narcotizes the highest evolutionary level of self-control and inhibition and the self-regarding sentiments, determining judgment and volition. Under social conditions of jovial festivity, bright lights, the opposite sex, conversation and song, alcohol appears to be a stimulant and to cause emotional excitement, a brisk flow of ideas and their outward expression in speech and conduct. But if alcohol is taken under conditions where external stimuli are lessened or removed, such as isolation in an armchair in a quiet room, the effects are quite different: *viz.*, a slight feeling of "light-headedness" followed by an increasing heaviness and disinclination for effort, soon passing into drowsiness and finally sleep. In both cases the alcohol has narcotized the highest evolutionary level, but in the former the negative state has left the next level open to perceptual stimulation, and we have a brisk flow of ideas and emotional expression. The true temperament of the individual is shown, hence the saying "*In vino veritas.*" One individual may

become elated, jovial, boastful, boisterous and gay; another maudlin, sentimental, sad and tearful—*vin gai* and *vin triste* of the French.

The self-regarding sentiment is affected in various ways, *e.g.*, financial, domestic, sexual, social anxieties, and worries, attended by despondency. Therefore alcohol, by its narcotic effect on the highest evolutionary level, tends to banish sorrow till to-morrow, and may be beneficial if it is not allowed to become a master instead of a servant. Contemplative fear arrests digestion and assimilation, and upsets the general metabolism of the body, and this reacts back on the highest level of the brain.

It has been shown experimentally and clinically that suspension of function of the highest levels of the cerebrum may be caused by suspension of oxidation processes (Mosso's experiment). It has been shown also that microbial toxæmia may cause varying degrees of suspension of function of the highest levels, causing delirium and mental confusion. In the insanities which recover without any dementia we assume there was only a suspension of function in varying degrees of intensity, and that this was brought about by circulating toxins causing synaptic neuronc dissociation in the higher levels. If the highest autocritical inhibitory level, *A*, be assumed to be functionally abolished, and the next level, *B*, perceptual and ideational, only partially affected, then this level will—owing to the abolition of *A*—overact, but to a limited extent, owing to this level also being affected, although to a less degree than *A*. This will be manifested by disordered ideation—day-dreams and strange conduct. If there is a complete suspension of function of *B* a catatonic stupor results, broken at times by sudden uncontrolled impulsive actions, no doubt excited by a partial return of ideation in the disordered form of illusions, hallucinations and delusions.

The fundamental clinical disorders of dementia præcox are a weakening of judgment, of attention, of mental activity and of creative ability, the dulling of emotional interest and the loss of energy. Lastly there is the loosening of the inner unity of the psychic life. Now, if we assume that the neuronc changes show first a progressive suspension of function of some neurons associated, secondly, with such intense biochemical and morphological changes in other neurons as to indicate the suppression of function, we are able to explain remission or partial remission of some of the symptoms, and sudden changes from stupor to impulsive behaviour.

*Suspension* of neuronc function due to hypo-function from defective oxidation processes or synaptic dissociation caused by auto- or heterotoxic conditions may vary in intensity and degree,



but suppression of function owing to germinal lack of durability is incapable of any remission, but is progressive, so that even when a remission of some of the symptoms occurs there is a residuum of weak-mindedness—*dementia simplex*—which is usually progressive and continuous. It should be mentioned that the neurons are, in the normal individual, permanent cells adapted for a prolonged life, and protected by special anatomical and physiological conditions from injury and disease.

Now it is known that some cases which at first clinically appear to be cases of *dementia præcox* recover. Moreover, some cases of confusional insanity and benign stupor, described by Hoch, may present a clinical picture of *dementia præcox* and recover completely. It must be supposed that these cases are due to a hypo-function with synaptic dissociation, and we might find a general condition of lipoid granules in the neurons, with basophil chromatolysis and disappearance, or partial disappearance, of the Nissl granules, but no evidence of nuclear degeneration.

If there were a biochemical and morphological degeneration of the nucleus it would point to a condition which would end in suppression of function, although this condition does not necessarily imply death of the neuron and atrophy of the axon. The morphological changes implying suppression of function are found especially in the cortex and particularly the cortex of the frontal lobe (highest evolutionary level), in which neuroglia proliferation is most marked. Associated with this are universal changes in the various regions of the brain pointing to hypofunction, *viz.*, lipoid granules in the cytoplasm, and in many cells an oxychromatin or a tendency to an oxychromatin reaction of the nucleus.

The affection of the stellate intercalary cells which enter into the synapse, and the evidence I have adduced of the importance of these cells in connection with oxidation processes productive of neural energy and transmission of nervous impulses, suggest that a hypofunction or suspension of function of these neurons would lead to a synaptic dissociation and the coming and going of symptoms; or where there is a permanent morbid change, to a suppression of their function with permanent dissociation.

We have thus two morphological conditions which will account for fundamental disorders, and the nature of these disorders will depend upon the cerebral structures affected, whether in such a way as to produce suppression or suspension of function. Naturally the nature of the mental disorders will also depend upon the localization of levels and the relative intensity of the suspension, or suppression of function of the neurons.

It is quite probable that there is a hypo-function of the whole

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of the bodily tissues ; there is certainly a diminished vital resistance to microbial infections. And I have shown that there is a regressive atrophy of the reproductive organs and of the pituitary and adrenal glands in the majority of the cases diagnosed as dementia præcox. A large percentage of these cases of dementia præcox died of tuberculosis, but my observations show that exactly the same neuronic and reproductive endocrine gland changes can be found in dementia præcox subjects that have died of acute pneumonia, or as in a case of acute dementia præcox described without any intercurrent affection to account for death ; and I will now show some illustrations of this case. Although it is common to find stupor in patients affected with active tuberculosis, and although the absorption of toxins may, therefore, have played a part in the production of some of the symptoms in dementia præcox, yet I have formed the conclusion that the essential cause of this disease is an inborn germinal defect of the body generally, but especially affecting the highest evolutionary levels of the brain and the reproductive endocrine glands.

In conclusion, it may be thought, from what I have said, that the outlook in regard to the prevention and curable treatment of insanity is rather hopeless. That is not so: all I wanted to show is that we must recognize the great importance of the inborn factor in the production of the psycho-neuroses and psychoses.

The possibility of variations and mutations in the highest plastic evolutionary level must necessarily be associated with a certain degree of physico-chemical instability. It is that which makes it a more complex, refined and delicate mechanism, and therefore more susceptible to the influences of all toxic conditions of the blood, to the influence of good and bad imitation and suggestion, to the acquirement of good and bad habit formations in early life, to the effects of physiological stress at the critical periods of life, and to all forms of emotional shock, prolonged anxiety and contemplative fear. This higher degree of plasticity is the price a nation has to pay for a high degree of civilization and the elimination of many of the factors of natural selection and survival of the fittest. The effect of anticipation or the tendency to the advent of mental disease of the children of insane parents in adolescence, together with regressive atrophy of the reproductive organs, leads to a tendency to end or mend a stock. To regard disease as unpreventable or incurable is, as Francis Bacon said, to establish negligence and carelessness, as it were, by a law, and screen ignorance from reproach. It is our duty as medical men to practise general medicine in its broadest sense, and see if there is any bodily condition which can act as a cause or contributory factor in the production of the abnormal psychic state. By prevention and early treatment of

all those causes, whether physiogenic or psychogenic, which act as exciting factors in the production of the psychoses and psychoneuroses, it may be hoped that the abnormal mental states constituting them may not become firmly installed and organized, thereby causing a vicious circle to be established. For the persistence of abnormal mental states produces digestive, assimilative and metabolic disorders of the body, and auto-toxæmia, which can react back on the highest evolutionary level of the brain, tending to permanent functional disorder and eventually to its partial or complete abolition—secondary dementia.

A streak of insanity, a streak of genius and creative imagination is not harmful to the race. The danger to the race is not from a tendency to a high degree of plasticity of the highest evolutionary level, but to an increase of an inborn tendency to a functional or organic regression of it, resulting in various degrees of imbecility. As the higher-grade imbecile possesses the animal passions and is fertile, it follows that more than a streak of mental deficiency in a race constitutes an urgent social problem of national importance. Hitherto nearly all the efforts of the State have been towards legal detention of the mentally afflicted (under humane conditions it is true), but little has been done in the way of prevention or cure. I hope that this Society will, in the future, take an active part, firstly, in promoting research in the biological, social and psychological causes of mental disease, with a view to prevention; and secondly, in furthering the application of the principles of general medicine, including psychotherapy, with a view to the cure or alleviation of mental diseases and disorders.

(<sup>2</sup>) In the *Archives of Neurology*, vol. vi, two valuable communications are given: "The Investigation of Twenty-five Pedigrees of Insane Persons," by Dr. Hill Wilson White; "The Investigation of a Number (Ten in all) of Family Histories of Patients in Cane Hill Asylum," by Dr. J. C. Wootton. These are very carefully constructed pedigrees, extending from three to six generations and including collaterals.

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*Encephalitis Lethargica—its Psychological Implications.*(<sup>1</sup>) By

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THE gradual rise in the yearly incidence of encephalitis lethargica, culminating in the serious epidemic which marked the first half of the past year, and the tragic results which so often follow, have invested this disease with a sinister importance. But there are other reasons which make this infection peculiarly suitable for

(<sup>1</sup>) A paper read at the Annual Meeting held at Birmingham, July 8, 1925.