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IV. INSANITY: GENERAL PATHOLOGY.—To bring the data observed in the cases of insanity in line with the data of pathology generally is a very difficult task on account of the heterogeneous character of the material. It is safe to say that for a general pathology there must be sound material of special pathology. The literature of special psychiatry is, however, unfortunately, more conspicuous by quantity than by broad scientific points of view, and only here and there we can discern successful efforts to bring the observations on the level of standards which hold for pathology generally: trains of established evolution and causal connections. The following sketch is an attempt to show the principles with which we proceed to-day, and for examples we must refer to the articles on special pathology.

THE DATA OF PSYCHIATRY.—The phenomena which we get for the formation of a scientific picture of a case of mental disease are, *First*, the general data concerning the family type and the occurrence of special diseases in other members of the family. *Second*, the data concerning the condition in which the patient entered the causal constellation which we designate as the disease. *Third*, the string of phenomenology or symptomatology of the entire disease; (*a*) the deviations of the course of reactions in which the mental phenomena are essential features, the mental symptoms proper (including as much as we actually know of the objective or physical signs of "mental" reactions); (*b*) the disorders of the organic mechanisms (circulation, digestion, respiration, secretion, reproductive organs, and nervous system); (*c*) the findings in autopsies, the anatomical findings of the deviation from the normal processes of life, naturally obtainable in only a portion of the cases, because few die of the "mental" disease. This group of data is often treated separately for practical reasons and on account of the character of the method of investigation; but so far it has been but little productive in the general frame of a pathology of insanity.

To reduce these heterogeneous data to some sort of useful and practical order and especially into strings of causal connection is the task of a general and special pathology of insanity.

The distribution of the work in this HANDBOOK has decentralized the analysis of the various groups mentioned above. It will be necessary, however, to encroach upon the fields of other contributors at least to the extent of showing some of the principles which guide us in the utilization of the various facts for reasoning in pathology.

There are two ways of entering upon the study of mental aberrations. First, the consideration of *disorders* which are *produced* experimentally and under definitely known conditions. Second, the study of the *phenomena* of insanity as they present themselves *in a large practical experience*. These two proceedings must co-operate and tend toward the ideal that we should be able to understand all the happenings in mental pathology with principles of thought which come up to the accuracy of those of experiment. The extent to which this can be obtained is identical with the extent of accurate knowledge of the pathology of insanity.

Considering the large number of varying types of deviation from the normal and the small number of experimental products in these lines, we find ourselves forced to lay the emphasis on the purely empirical material of the physician, and we shall investigate how we can hope to bring some order into the immense material. It is rather striking that most of the serious study has been paid to the things which are most difficult to establish and interpret properly, viz., to the problems of heredity and to the problems of pathological anatomy. Either of these lines is not usually accessible to actual observation; the one represents hearsay facts and the other seldom facts which can be directly related with the actual psychosis; and it must be our attempt to work for a more satisfactory position of the variations of life processes in the general scheme for studies. That is to say, we must learn to use for diagnosis, prognosis, and therapeutic possibilities that which we actually meet in our practical problems, the symptom complexes and their causal connections, and the evolution of the symptoms.

THE DATA OF HEREDITY.—In order to make up for the meagre data concerning the foundation of insanity in the individual, the alienist has attached great value to the finding that in a great number of cases the patient is not the only member of the family that shows abnormalities. The family history of any moderately large group of cases of insanity shows a relatively frequent occurrence of mental disorders, nervous disorders or various "diatheses," and the conclusion is drawn from it that where there is a "history of gout, rheumatism, diabetes, gravel, phthisis, migraine, epilepsy, asthma," or of peculiarity of character, criminal record, or nervous or mental disorders in one or more persons of the family, a "morbid taint is fully established." Under the influence of the general views of evolution and dissolution the concept of the *morbid taint* has moreover been closely associated with the concept of *degeneration*.

The data of heredity of mental disease have been brought into prominence chiefly by Morel and under the influence of Magnan and Lombroso and their associates.

From the great amount of literature we select the following types of contributions. On a very favorable material in a Canton of Switzerland in which the movements of the population are not excessive, Jenny Koller* has studied the histories of 2,273 patients admitted between 1881 and 1892. Heredity was noted in 78.2 per cent. In 64.3 per cent. of these cases, or 50 per cent. of the whole, there was direct heredity—a disorder in the father or mother, or in both; in the rest, heredity was collateral, or atavistic. The heredity is somewhat greater in the women than in the men, 81.7 per cent. against 74.9 per cent. The material of comparison consists in the accurate family history of 370 mentally healthy individuals of the same layers of the population, and 370 consecutive admissions of the years 1885 and 1886 were chosen for immediate comparison; and the facts were classified in the following table:

	A—Normal series.		B—Insane series.	
1. Mental diseases	57	26.1 per cent.	39.8 per cent.	113
2. Nervous disease	38	17.4 "	10.2 "	29
3. Alcoholism	55	25.2 "	22.2 "	63
4. Apoplexy	36	16.5 "	5.6 "	16
5. Senile dementia	10	4.6 "	2.8 "	8
6. Peculiar character	16	7.3 "	18.0 "	51
7. Suicide	6	2.8 "	1.4 "	4
	218			284

The next table gives the relative percentage of direct, indirect (atavistic), and collateral heredity.

A comparison shows how very important the direct heredity of mental diseases and peculiar character of the parents is among the insane, whereas nervous disorders and apoplexy and even suicide happen to be found in larger numbers in the families of the normal than in the families of the insane.

Ball and Régis ("Les familles des aliénés," *l'Encéphale*, 1883) described a definite "cachet" of heredity in the descendency of various mental disorders. In normal families the causes of death are greatly varied and distributed in almost equal proportions among the various groups of

* Archiv f. Psychiatrie, 27. Bd., S. 286.

	DIRECT.		INDIRECT.		COLLATERAL.	
	Normal. Per cent.	Insane. Per cent.	Normal. Per cent.	Insane. Per cent.	Normal. Per cent.	Insane. Per cent.
1. Mental disease	10.1	25.4	11.9	7.7	4.1	6.7
2. Nervous disease	11.0	7.4	4.6	1.8	1.8	1.0
3. Alcoholism	14.2	19.0	10.5	2.2	.5	1.0
4. Apoplexy	7.8	4.3	8.2	1.2	.5	
5. Senile dementia	.5	2.1	3.6	.7	.5	
6. Peculiar character	3.2	15.8	3.2	1.2	.9	.7
7. Suicide	.9	.7	1.9	1.1		
Sum of factors of heredity	47.7	74.7	44.0	15.9	8.3	9.5

disease; there is no special tendency to repeated affections of the same apparatus. Ball and Régis showed that general paralysis is followed chiefly by brain affections; while mental disease and neuroses, alcoholism and consumption are not more frequent than in the normal. Non-organic insanity is followed by a diathesis of insanity, while brain disease, neuroses, alcoholism, and consumption are not abnormally frequent; epilepsy is followed chiefly by brain affections in childhood, while phthisis and alcoholism are prominent in the ascendency; epilepsy itself is rarely transmitted as such; hysterism is followed most frequently by nervousness; alcoholism by a disposition to phthisis and brain diseases in childhood. Morel points to a frequently quoted progressive type of familial degeneration in alcoholism which leads to decline, to idiocy, within four generations. Experience certainly favors the statement that the existence of cases of mental disorder opens greater statistical chances of developing mental disorders in other members, and where this fact is present in a family the disorders are apt to appear at an earlier age and to show a greater tendency to relapse. On the other hand, hereditary attacks are often slighter and more curable and the danger for life is less. In a large number of individuals with insanity in the ascendency there are no psychopathic traits at all; moreover, in many patients with essentially degenerative phenomena the hereditary data are negative. The assertion that "the subject of ordinary insanity is not a normal individual, that there exists in his constitution a latent disposition which any accidental determining cause may at any moment transform into evident symptomatic manifestation" has its corrective in this last remark and in the experience that there are "thousands of predisposed persons who escape the graver risks of their faulty inheritance and pass through life untarnished by insanity."* In order to make the occurrence of mental disorders intelligible in some people, we pass over a large percentage of humanity a verdict as gloomy as the dogma of infant damnation, unless we recognize the limitations of the statistical method and do not overdraw its positive and negative value. True to the fact, pathology should avoid this unnecessary evil prognostication, except where it is actually justified by the events. For the purposes of real individual pathology, we are obviously forced to search for more important data which would explain how it is that a certain proportion of members of families "with a morbid taint" tend to represent an abnormal variety. We are encouraged in this direction by almost all the data above mentioned, if at least we know how to read between the lines, especially such facts as: that educational influences under mere peculiarities of the parents or criminal surroundings are far more serious than the record of a decided attack of insanity of one of the parents, and that forms of insanity classified as particularly hereditary not infrequently occur without any evidence of "heredity" at all.

For principles of pathology we cannot admit statements about heredity as digested material except:

(1) Where they apply to large numbers, and mean to be of general bearing;

(2) Where we have sufficient certainty that the feature attributed to heredity cannot be explained more directly on grounds of influences during growth, education, and other determinants of the individual life; and

(3) Where the *corpus delicti*, the inherited feature, has a sufficient relation to the disturbance of health.

These clauses are meant to apply to the so-called "stigmata." They will exclude completely a considerable number and place another large portion on the list of true accidents of *development* for which the pathology of growth is still to be worked out before they should be used for more than signs of mishaps of growth, the bearing of which should be stated in every instance and case. I should repeat concerning them a remark made in a review of the "Signs of Degeneration and of Methods of Registration" in the *American Journal of Insanity*, January, 1896, p. 345: "Probably for a long time to come the study of mental capacity and potentiality will be best carried out by studying the psychical manifestations rather than the physical forms of the person," inasmuch as the majority of the physical signs of degeneration are utterly uncorrelated facts, and of value only as remote collateral evidence of difficulties of development.

These critical remarks do not attack the facts of heredity but their looseness and hasty interpretations. There are indeed some types of mental disorders which we look upon as constitutional in the sense of familial, and some types of disease which might be called at least equivalents of one tendency (dissimilar heredity). But it is of no small interest to see that in these heredity is not always the only possible or even probable explanation, and that we probably go too far in appealing to the dogma without enough analysis.

A final reference may be made to the very noteworthy study of Dr. Vorster, of Stephansfeld. Eleonor Fitschen had found that positive hereditary data were not more frequent in periodic (manic-depressive) insanity than in mental diseases generally, but that there was a greater number of real mental disorders mentioned. Vorster has shown that in families with manic-depressive insanity he found seven with exclusively manic-depressive insanity in the ascendency, and in none of them any cases of dementia præcox; in eight families with several cases of dementia præcox there was no case of manic-depressive insanity. This article* is worth quoting for the purpose of possibly dissipating a number of traditional illusions of the frequency of heredity and of the relative value of factors and as an instance of what precautions are needed for valuable studies in this field.

THE DATA OF ETIOLOGY.—Looking over the determinants of make-up and of deviations of life implying mental disorders, we again meet with the problem of heredity with most writers. At the present stage of biological knowledge, especially in view of the facts collected by Weissmann, we see in the liberal use of principles of generic life little more than the term for the unknown quantities in the concept of *constitution of the individual*. Constitution is the sum-total of the make-up of an individual. Every good history of a case of mental disorder should give us accurate information concerning the make-up of the person before the complex constituting the disease was complete. The types of make-up are approximately grouped as types of constitution, as far as possible without reference to the final event which is supposed to enter only under definite additional influences.

The concept of constitution has come into discredit because pathology has been more fortunate in detail work than in this general problem. Kraus and Martius have finally put it on truly pathological foundations, *i.e.*, on principles which can be understood from what is accessible to study, and does not need the designation from a merely possible result (as, for instance, in the term apoplectic constitution; we should not speak of an apoplectic constitution, but of the presence or absence of arteriosclerosis). Kraus has pointed to the tests of fatigability

* Macpherson: "Mental Disorders," p. 22.

* "Ueber die Vererbung endogener Psychosen in Beziehung zur Classification." Monatsschrift für Psychiatrie und Neurologie, April and May, 1901, vol. ix.

as a measure of the constitution of the heart; and Martius to similar types of function in the stomach, and more directly in our field we find the study of individual types of neuromuscular reactions taken up by the schools of Kraepelin, Sommer, etc. They are only fragments, though but a no longer mystical attempt to bring a useful order into the descriptions of the make-up which the clinician already distinguishes as types of instability, etc. In ordinary language, we do well to look to the nature and extent of the development, the habits and the efficiency, as the chief features of the constitution of an organ or an entire person. The features of comparison must be chosen somewhat arbitrarily, but with preference among items which can be brought in line with other biological facts, constituting diseases. Thus, the pathologist will arrange people from points of view different from those of the moralist or the artist or ordinary statistician.

Psychiatry has done little in the differentiation of types so far. It limits itself to the general classification as to whether a person is neurotic or not. We need further subdivisions. Kraepelin supposes that one developing paranoia must show from the start traits different from those of the hysterical or the manic-depressive. In a general way, our hope for clews lies in the direction of studies like Kraepelin's (mainly from the point of view of fundamental characteristics of neuromuscular and mental reactions studied under the influence of fatigue, practice, toxic interference, etc.); further, of studies concerning the influence of variations of habits and functions of other organs on the nervous system, the ease of reaction to toxic and autotoxic febrile influences, and the existence of types of abnormal metabolism, such as may perhaps lie behind the group of facts covered by the claims of the uric-acid theory. And for practical orientation we use characteristics like those of sociability or seclusiveness, efficient and systematic or desultory nature, determination or oscillation, social or anti-social instincts, normal or abnormal sexual life, the existence of definite psychic peculiarities and defects, etc. For practical purposes and for possible avenues of research all these features offer problems nearer those of fundamental individual pathology than the theories of heredity can offer, because they are present in the available subject of our study, the patient.

The other factors which are necessary to make complete the conditions for the development of mental disorders are in about the order of their frequency: direct and indirect toxic effects of alcohol and other poisons; direct or indirect consequences of infectious conditions; direct or indirect damage of the nervous system by senility, organic lesions, etc.; and effects of exhaustion, or the occurrence of excessively dominant preoccupations. However vague some of these general designations may appear, their usefulness in modern mental pathology makes them a worthier subject of investigation than are many high-sounding speculations. The article on etiology will enter more fully on this topic.

The Pathological Value of the Evolution of Symptom Complexes.—The data of this part of psychopathology are to be found in the fields of clinical investigation and post-mortem manifestations.

In reality, most of the components which determine mental diseases belong already in the field of symptomatology, *i.e.*, of manifestations of abnormal conditions. A further point for consideration, a very important one, is the form of termination which closes the working of the disease principle. From the sum total of the manifestations and their causal evolution we are accustomed to derive an abstract principle of the "disease type" or "disease process." To this is referred the whole string of events which we have reasons to designate as abnormal.

At first sight there seems to be a formidable chaos before us, especially when we find ourselves under the influence of a feeling of inadequacy produced by the older efforts of school-psychiatry in these lines. Their abstract half-philosophical classifications do not fit into the ways of thought of the physician. Hence the traditional sigh: There is no pathology of insanity as yet. In reality the conditions are not at all hopeless. The experimental neatness of bacteriological pathology makes us too fastidious and perhaps also too lazy to develop standards and methods of other lines of pathology, such as are needed for the pathology of the skin, or of the kidneys, or of the liver, or of digestion, where more than bacteriology and also more than histology is needed to reach the standards of experiments. What we know of the pathology of the various forms of Bright's disease, or of cirrhosis of the liver, or of diabetes, or even of the condition of development of some forms of pneumonia, is not a particle clearer than are the few facts which we possess for the appreciation of delirium tremens, or general paralysis, or even dementia præcox, although we can boast that our inventory of distinctive manifestations is rich in palpable and also microscopically magnified post-mortem findings. The anatomical findings are as much in need of a "pathological" explanation as are all the other manifestations. Just as in many diseases in which mental reactions are not involved, the establishment of causal chains of so to say experimental strength is not far advanced in psychiatry; but there are valuable beginnings and there is much material for a natural and useful classification of the deviations from the normal and a good start for a "mental" pathology.

This is, of course, excluded if all the work is limited to grouping the features according to the scholastic division into mental symptoms, and functional (dynamic or physiological) and physical or morphological manifestations without due consideration of their evolution. Attempts are usually made on the "physical" side, and those on the "mental" side are classified and arranged logically, but not sufficiently as part of the whole economy. As soon as we analyze mental facts we follow the path of least resistance and think more of logical justification than of the relation to the trend of the individual biological household. We get satisfied with the fact that a depression is not adequately founded; that voices are heard or things seen which are not there, that the patient is suicidal or dangerous, etc. In other words, we adapt ourselves to be satisfied with what the judge needs for the commitment. We see, however, no reason why we should not embody the reactions of the individual which happen to have the quality of mental reactions, in a general plan of the individual human household, with due recognition though that morphological facts and physiological facts and mental facts are recognized from different standpoints, overlap, and must be reduced to a common denominator before they can be material of a harmonious pathology of experimental accuracy. Even without an ideal simplification, we can establish sufficiently valuable strings of facts to refute the belittling comments of mere resignation.

The analysis of a large number of faithful records of cases of insanity furnishes certain natural groups of almost identical conditions. The similarity may lie in the etiological constellation, or in the temporary symptom complexes, or in the general course with reference to sequence of symptom complexes, or with reference to the outcome of the whole process and the events in the subsequent life of the patient. Where there is a coincidence of the main points in all the four directions we have every reason to surmise a definite law of development, especially if the type occurs often enough to free one of the impression of chance. Where three or only two of the directions coincide, we have at least reason to search for the value of the points of coincidence as compared to those of difference.

Our habit of seeing in the successful experiment the proof of an empirical claim leads us to give very strong prominence to the *etiological constellation*. The difficulty of establishing it is, however, not small. Not only do we often fail to get the necessary accurate information, but even where the conditions develop under our eyes we often fail to be able to foretell what the effect and the outcome will be, on account of the acknowledged personal differences which we are not able yet to estimate

with more than approximate accuracy. The most common illustration met with in practice is that of alcoholic insanity. From the mere pathological forms of intoxication to the delirium tremens, and the subacute alcoholic hallucinosis, and finally the chronic alcoholic paranoia and the alcoholic polyneuritic psychosis and pseudo-paralysis and alcoholic senile affections, and recurrent "alcoholic" mania, or "alcoholic" dementia præcox, we see the factor alcohol enter a number of sets of constellation with a rôle of variable importance, and we see clearly that the etiology cannot be exhausted by one factor. It is a complex function of one or more determining factors with definite types of make-up and temporary or lasting conditions (such as gastritis, or states such as are characteristic for epilepsy, periodic insanity, or dementia præcox or senility), the coexistence of which makes the condition more complicated but in principle at least none the less as clearly accountable for the consequences as if only one factor were needed for an experimental test.

The value of symptom complexes as such has probably been overrated at various times. Some of them have caught the attention as typical because they seemed plausible and were easily described and communicated, from the point of view of the normal, such as depression, etc. Others are refractory and scarcely described in most text-books. As such, the value of symptom complexes for the estimation of pathological processes cannot be tested too carefully. Even short experience shows that apparently identical symptom complexes occur under so variable conditions that conclusions drawn from a temporary picture as to etiology and outcome and the general nature of the conditions are apt to be guesswork. The most valuable determining feature is, as a rule, the *form of evolution* of the complex, the time and duration and circumstances of its development, and the character of possible transformations of the picture. The great wealth of forms does not exclude the justification of the hope that at any given moment we may learn to find features characteristic for definite special types of evolution, such as we see in a certain kind of disorder of the sensorium, in certain acute delusional episodes, or in monotonous and strained productions in hebephrenic and catatonic excitement different from the excitement of simple or recurrent mania, etc. Distinctions will strike us only if they are suggested by definite *demands* for distinctions built on the experience concerning types of definitely known etiology and evolution. In the evolution of the symptomatic phenomena the *form of the outcome* is probably next in importance to the etiology, inasmuch as it furnishes an index to the amount and nature of damage done. Classical instances are general paralysis and Kraepelin's manic-depressive insanity. Both these groups show moreover that the forms of the symptom complexes may appear fundamentally different and variable unless we consider their evolution, which shows them to be empirically referable to just one typical form of general course and outcome. General paralysis with its fairly established etiological constellation and its almost uniformly demonstrable dementia and neurological disorders and fatal termination offers a large variety of symptom complexes which we can grasp correctly only if we are familiar with specific traits that characterize the disease as a whole and especially the form of dementia and the combination with disturbances of the nervous apparatus proper, over which even remissions simulating recoveries cannot, as a rule, deceive a trained diagnostician. And manic-depressive insanity certainly shows us that a disorder strikingly characterized by its run in definite attacks with little tendency toward dementia offers many equivalent symptom complexes of greatly different appearance and nevertheless must be recognized as at least an empirical entity, with fairly distinct fundamental symptoms. No form shows better how much more fundamental symptoms mean for pathology—*i.e.*, an understanding of the bearing of a disorder—than this one contrasted with the mere superficial divisions into "mania" and "melancholia," the "attendants' diagnoses" of most statistics.

It is obvious that as psychiatry progresses, the recognition of large types or nosological entities leads to further detail investigations of the temporary symptom complexes and that the results of the latter may, in return, demand considerable readjustment in the concepts of large types. We certainly have sufficient reasons for the presumption that it is possible to recognize definite types of evolution of disease: that for the various types which show superficially similar symptom complexes, we may learn to find distinguishing features from which to draw distinctive conclusions for diagnosis, prognosis, and treatment. Only inasmuch as division into types and classes leads to actual advantages, they will have an interest from the point of view of pathology. Classifications for the simple purpose of reducing the chaos to a merely logical order without any help in the direction mentioned is to be looked upon with suspicion as possibly a soporific for actual purposeful investigation. For some time to come it will be desirable to make many groups, to avoid deceptive simplicity, to remain on the ground of carefully observed series of cases, and to take generalizations as purely hypothetical temporary helps, unless the conditions which hold for experiments can be said to be thoroughly observed.

Whatever general classes we adopt we must see that they form steps toward the finding of common denominators of the mental, functional, and morphological symptoms. We study them all from the point of view of types of reaction of the whole individual rather than that of purpose or that of purely mental symptoms. What impresses us as mental symptoms involves, as a rule, movements of expression, and changes of circulation and chemism, and apart from these changes co-ordinated with the mental symptoms as they appear to us, there may be special disturbances of the organic mechanisms of the body without direct correlation with the mental symptoms but of deep importance in the whole disease process. We put down the established facts in a loose chain connected only as far as our actual knowledge goes, and we frame our provisional disease picture with due reference to all the features: etiological constellation, evolution of the symptom complexes, course and outcome. Experience shows that this method furnishes general concepts of great use in formulating diagnoses which mean something for prognostic and therapeutic purposes, and that it puts workable problems for investigation into our hands.

The Metabolism in Psychoses.—Much has been made of the importance of metabolism and of auto-intoxications during the late nineteenth-century revision of humoral pathology. Unfortunately there exist only a small number of useful contributions in this direction.

Studies of the weight—usually without any regard for the amount of food consumed—have come to varying results of purely empirical value. The most commonly accepted one is that during an acute psychosis the weight is apt to decrease. When it begins to increase together with an improvement of the mental symptoms, the general prognosis seems much more favorable than when increase in weight is not accompanied by mental improvement.

A point of general pathological interest is the question whether the changes in metabolism are directly influenced by the central nervous system. For the decision of this question we have no sufficient data and we need more than mere determinations of weight.

The studies of the *urine* suffer from being incomplete or not correlated accurately enough with the other facts of metabolism which would help us form an accurate idea of the bearings of the results. They usually run along lines of interest in general medicine, and only a few are part of accurate studies of metabolism.

There exist studies on *albuminuria*. In this country they were intended to show how frequent disease of the kidneys was in the insane (Bondurant). Frequently delicate methods were used which are not applied in other fields of medicine, and with this the finer feeling of proportion concerning the importance of the findings was

disturbed in favor of excessive findings in the insane. Albuminuria with a definite relation to mental disorders has been noted transitorily and parallel with the degree of the mental symptoms in a number of cases of delirium acutum, mania, delirium tremens, paralytic fits, etc., where "nothing" pointed to nephritis. In these conditions an influence from the brain akin to that in experimental albuminuria has been claimed. But a different explanation would be as probable, viz., that in the height of the disease the otherwise resistive kidneys may be influenced by the conditions which bring about the much more striking brain symptoms. This would be a more cautious expression than that of influence of the brain on the kidneys, used by Köppen.

Albumosuria or propeptonuria has been found in mania (Pilcz) and also in connection with albuminuria by others. The bearing of its occurrence is not sufficiently established.

Peptonuria is not sufficiently clear in its bearing, but it has been found oftener in the insane than in other patients, outside of conditions of putrid or suppurative processes, perhaps owing to the increase of output of motor energy.

Glycosuria has been described occasionally, but has only casuistic importance.

Acetonuria and diaceturia have been traced to febrile, diabetic, and cachectic conditions and to states of underfeeding. They have been found frequently in paralysis, in melancholia, in the beginning of acute psychoses, such as amentia, delirium tremens, postepileptic deliria, etc. Their bearing is not certain.

Ptomaïns and leucomaïns would seem to be important factors in view of the fashionable auto-intoxication theories. The effects of injection of the urine of patients into animals are very difficult to interpret and have not led to any safe results, contrary to what is claimed especially by French investigators. Whether the Naegeli-Klingmann reaction of certain algæ to diluted blood serum of various types of patients will lead to more fortunate results remains to be seen.

Of late some empirical efforts of influencing metabolism have been introduced in the form of thyroid feeding and of serum treatment. The results and the methods as such belong more properly in the chapter of therapeutics, as most of the reports do not fulfil the conditions of careful experiments.

Pathological Anatomy.—The second large field of symptomatology is pathological anatomy. It is the fact that just in this direction relatively little has been achieved and that the little is difficult to understand, a result that gives food to the idea that "there is no pathology of insanity as yet." Under the sign of the cell concept, pathology has become, to perhaps an undue extent, a science of what is met with in the dead. To be sure, ordinary pathology also occupies itself with the living; but chiefly along lines which lead to an understanding of definite pathological lesions which we see fully only in autopsies, while the insane reach in death a stage of existence in which they are but slightly if at all distinguishable from the remains of the sound. Apart from profound idiocy, general paralysis, senile and organic dementia, and a few conditions which entail peculiar attitudes and consecutive deformities, the majority of the bodies of the insane furnish at the present stage of knowledge no data which would answer satisfactorily the question: What distinguished the patient from a person with the same physical ailments but sound mind? or the question put to me once after a medico-legal autopsy by the foreman of a jury, And what did you find on the mind?

Pathological anatomy must have been a field in which the physician had a right to seek refuge from the bewildering flood of dogmatism concerning the mental symptoms. It has become fully as speculative though as that of the dynamic and psychological side of man, and the assumptions of histopathologists who compounded their theories out of "tangible" material and data derived from anatomy, have certainly been fully as great and bewildering as the ones compounded by those psychologically inspired.

Normal neurophysiology and neurohistology have gone through very interesting and instructive phases during the last century. The memory of the up-and-down movements of dogmata should cure us of exalted expectations as to their maturity as exclusive guides and starting-points. The senseless use made of hyperæmia and anæmia of the nervous system for the purpose of explanation of pathological states, the endless misinterpretation of artefacts in histology, the shifting of the actual function between nerve cells, nerve fibres, and even the neuroglia—all this should caution us. It is not within the scope of the topic allotted to me to say what can be considered the safe data which had best be taken over into the new century. A sketch of some of the fundamental concepts is given in my "Critical Review of the Data and Methods of Modern Neurology," *Jour. of Comp. Neurology*, vol. viii., 3 and 4, and a summary of "Morbid Conditions of the Nerve Cells" in Robertson's "Pathology of Mental Diseases," and in *Brain*, vol. xxii., pp. 204–327.

For didactic purposes the make-up of the nervous system has been reduced to schematic diagrams the importance of which is apt to be overrated, and has probably been overrated in that unparalleled popularization of neurology which we have experienced during the last ten years. Neurology has been revolutionized by the neurone concept; but the new structure does not hold in its most popular form. Serious attacks call for a return to that which is actually established after the dissipations in neurone-retraction theories and the like. Developmental and pathological facts in connection with simple histology furnish laws of *growth* and *trophism* of the nervous system. With reference to growth and trophism, we know something like "neurones"; but the *dynamic* (physiological) and psychic series of data is not traced to individual neurones yet, and much more likely is referable to whole *sets* of histological "elements." Parts of the morphological series have been prematurely correlated with parts of the functional series of facts, and this has led to the fetichism of memory cells, perception cells, etc., and to rash correlations of appearances of nerve cells, etc., with functional states. We have not arrived at a stage yet when we might give a correct and exhaustive description of the nature and happenings of the apparatus of biological plasticity, the nervous system, in concise statements of the "neurone" and its life. A "psychiatry of the neurone" is probably a preposterous notion, and a pathology of the neurone apt to be one-sided, and missing very important facts of neuropathology which can be grasped only if we speak of the nervous system as a *tissue*. The recognition of this fact in more than one way keeps us above the contest for and against the neurone theory and we are less in danger of obstructing our way by preconceived dogmatic ideas. To go on without a realization of the poor foundation of mere dogma would probably add to the disappointments of the last four years.

The nervous tissues are constituted of the derivates of the epiblast (nerve elements, non-differentiated cells, and neuroglia), and the mesoblastic vascular outfit, sheaths (meninges), and membranes of support. Moreover, the various parts are exceedingly heterogeneous both in the general texture and in the structure of the constituent parts, far more so than holds for any other organ of the body. If there were not a remarkable constancy from individual to individual in the anatomical distribution of the tissue types and characteristic tissue elements, the very differentiation of the various parts would make it almost useless and even hopeless to try and enter into great details in a general pathology of the nervous system. It becomes almost of necessity a *special pathology* of the differentiated parts; and, indeed, this is what is furnished us by well-established neurology—the analysis of effects of special lesions in special parts with their immediate and remote consequences are the bulk of what is of value in pathological anatomy of the nervous system to-day.

In the first line we find the study of "secondary degeneration" of fibres; in some more studious investigators there is also a desire to know something about the fate of cell bodies belonging to the degenerating tracts. Further, we have good data on certain primary systemic degenerations. On inflammatory and other tissue changes beyond the minute local consequences of embolism and hemorrhage and injuries, and perhaps certain changes in myelitis and encephalitis, but little has become common property and safe knowledge of facts.

As soon as general problems arise, such as the pathological anatomy of paralysis agitans, we are led into a great deal of uncertainty which is shown to exist owing to the imperfect foundations for a general pathology, in this special case, owing to an imperfect knowledge of the senile nervous system. And in the sphere of mental diseases we find ourselves even more at sea because changes are found and would seem to be of importance which have always been passed over by the neuropathology of the level of the Weigert-Pal stain. Delicate newer methods have opened new paths and made great claims, and now it seems that they have not as yet been tried sufficiently in non-insane material to allow of a generally accepted discrimination of what conditions are normal or trivial, and which ones are pathological and how they are produced. So much has been made of findings with the delicate recent methods that the "pathological anatomy" related to psychopathology would be forced to be to a great extent a critical review of the results of some special methods, principally those of the type of Nissl's stain, those of the type of the Marchi reaction, those of the neuroglia stains, and to some extent those of the metallic impregnations (Golgi, Robertson, etc.). They have proved very helpful in the study of neuropathology for the types of myelitis and of multiple sclerosis and other disorders of fairly definite standing; not to mention the consequences of embolism, thrombosis, and hemorrhage, and within the field of psychiatry general paralysis and senile dementia, topics which are to be treated in the articles on special pathology, and to which we shall refer only as far as the principles are involved. But where they dealt with conditions found in ordinary "non-organic" psychoses, the details lacked the large frame found in general paralysis, multiple sclerosis, etc., and the judgment of the investigators was frequently at sea on account of the absence of a suitable material for comparison.

After all, the data obtained by the inspection of the brain as a whole, especially its weight and the condition of the membranes, have not been altogether eclipsed by what the recent methods of staining reveal. Moreover, it might be of importance for a real "psychopathology" to add a study of the condition of the non-nervous organs which participate in the "mental diseases," if such material did really exist.

Several text-books of mental diseases attempt to give an anatomical and anatomo-pathological outline, but these chapters are only rarely helpful. They limit themselves frequently to the cortex, and to the things which appeal to the alienist, and often fail to show a good sense of proportion to pathological concepts in general. It seems quite obvious that for a pathological anatomy of the nervous system all possible disorders, whether or not accompanied by mental diseases, must first be subjected to a sufficient study before the special cases which show mental disorders can be expected to furnish a sufficient material for comparison. Such a general pathology and *general pathological anatomy of the nervous system* are growing but slowly. To-day, the best and most helpful books on mental disorders happen to be those which speak least in terms of anatomy, and in this lies a very strong hint.

Averse to generalizations concerning the "neurone," we must leave the description of cell types and their reaction to the articles on nervous histology and general pathology of the nervous system. Since most of the data are in the stage of "uncorrelated facts," they must certainly be known to one working on the pathological anatomy of mental disorders, but are of no help yet in a general pathology of insanity. We give in the following a concise statement of what is likely to be a topic of discussion in *general pathological anatomy in connection with the insane*.

We do not know any disorders of nerve cells which could be considered specific for any special mental disorder, with perhaps the only exception of what may be seen in senility and idiocy. In idiocy, Hammarberg has demonstrated underdevelopment of cortical cells both in form and number; in senility we meet with usually pigmentary atrophy.

A great share of other disorders described in the literature are terminal affections, not directly connected with that which may represent the actual foundation of the psychosis *per se*. Clinically, too, we know that the dying insane patient is no longer merely "insane," but both physically and mentally his condition is different from the classical stage of the disease. What will be said here of cell changes and tissue changes is said without any reference to clinical correlations beyond what is explicitly stated.

With febrile agonal coma (as in pneumonia, etc.), we have learned to associate the "*acute alteration*" (of which Hoch gives a description in the *Journ. of Insanity*, vol. liv., p. 604), and practically identical with what the experiment of overheating produces: reduction of the stainable lumps into dust and more or less complete dissolution, diffuse stainability of the cell plasma, so that the dendrites and the axone show for an unusually long distance, even in cells and cell parts which show almost no stainable substance normally; the nucleus is either not changed or is swollen slightly, or less frequently diminished in size. Among the chains of the linin net, especially along the nuclear membrane and near the nucleolus, there appears a greater number of deeply stainable and fairly large grains reaching the size of "accessory nucleoli," but more deeply stainable by hæmatoxylin than the nucleolus itself. In the nuclei in which a reduction in size has occurred these grains are more numerous; the nuclei become darker and finally they assume a diffuse stain, and the nuclear membrane is apt to disappear. At the same time the nucleolus may grow larger and paler. In some of these cases the nuclei may show a fairly regular distribution of very sharp dots, while the membrane is hardly visible and the nuclear sap is delicately stained. These forms with darkening and diminution of size of the nucleus and usually crumbly decay of the cell body belong to the so-called *grave alteration*, which appears as a rule alone, *i.e.*, distinct from acute alteration, and impresses one as a much more serious decay almost amounting to liquefaction. It resembles certain forms of post-mortem alteration, but must be upheld as an ante-mortem product, as it has been observed in fresh autopsies of general paralysis and tuberculous meningitis (Hoch). This and the acute alteration cannot demand more than general neurological interest, as they both seem to be terminal appearances not directly associated with what is usually included among mental diseases. Another incidental alteration is the rarefaction; a reduction of stainable substance without affection of the non-stainable plasma, visible, especially in some cases of senility and general paralysis, in the motor cells of the medulla and cord and in some cortical types, with or without pigmentary changes.

A further change of almost mechanical importance is that produced by œdema, and described by Hoch* as "*shrinkage*." It affects especially the smallest and medium-sized pyramids of the cortex and hardly ever the largest elements. The nucleus becomes homogeneous and dark and loses its membrane; the cell body gets a honeycomb or crumbly structure, the cell outline and nucleus are distorted and shrunken, whereas in some of the smallest pyramids the cell body becomes distended, vesicular.†

* "Nerve-Cell Changes in Somatic Diseases." The American Journal of Insanity, vol. lv., page 231.

† See also Alzheimer: "Zur pathologischen Anatomie der Hirnrinde." Monatsschrift für Psychiatrie und Neurologie, Bd. ii., S. 96.