ORIGINAL ARTICLES.

EXPERIMENTAL RESEARCHES INTO THE CAUSE AND CURE OF DISEASE ALONG NEW LINES AND BY NEW METHODS.

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PART I.

IN this paper it is my purpose to very briefly describe certain experimental results which seem to have an important bearing upon the whole question of health and disease, and also to outline a series of proposed further researches along similar lines, and to describe some of the new technical facilities which will make such a study possible.

These medical researches are the logical outcome of a much larger body of psychologic and psychurgic studies, and scientifically speaking, constitute an organic part of this larger system of investigation. Hence, it will be necessary to most briefly epitomize this larger subject before describing the more special applications which are to form the province of this paper.

On the Origin of These Studies.—Many years ago, while pursuing studies in chemistry and physics, I observed that during certain days or hours my mind worked with greater facility and originality than during certain other days and hours, and I was lead to inquire experimentally into the causes of such variations in the productive and acquisitive capacities of my mind. At four different intervals during the day for two years I recorded each of the measurable environmental conditions, such as changes in temperature, moisture, barometric pressure, electrostatic potential, quality and quantity of light, etc.; and, also, four times each day for two years, I recorded each measurable bodily condition, such as temperature, pulse, breathing, perspiration, analysis of excretions and secretions, diet, etc.; and, also, four times each day for two years, I recorded all of my mental activities, and especially noted the times when the acquisitive and creative mental functionings were dominant and productive of best results—I noted also the times when my moods were depressed or exhilarated. A study of these records disclosed the fact that the times of exuberance and good mentation were synchronous with the times when certain of these bodily and environmental conditions were present or dominant in an unusual degree; and that the times of depression and lack of originality and intellectual power correspond with the absence of these conditions and with the simultaneous presence of certain other conditions.

I practiced those conditions which promoted favorable mentation, and avoided those other conditions which obstructed originality and intellectual power and which tended to cause katabolic moods, and the result was the discovery of an art of promoting desirable intellectual and emotive functionings, and of avoiding the undesirable functionings, which results constituted the discovery of an art of mentation which enabled me to increase my mental capacity, and to augment the quantity and quality of my originative work in invention and research. It is not my purpose now to describe these experiments or this art of mentation, which descriptions will be given in a forthcoming volume, but to indicate an important conclusion; namely, that our mental life in all its acquisitive and productive capacities is not merely directly influenced by every environmental and bodily condition, but that our mental powers and processes are the results of a functional interaction between the organism of the individual human being and the larger organism of the cosmical environment. That is, mentation is the result of two factors; first, the activities of the animal organism, and, second, the activities of the cosmic organism. The relation between the two is functional. The significance of this will be seen when, later on, it will be shown that all physiological functionings are psychologic in their character, and that the difference between an inanimate and an animate body consists in the fact that the animate body possesses Mind. The human organism is not only materially and dynamically part of the Universe, but, as these experiments show, it is psychologically part of the whole.

PSYCHOLOGY AND MEDICINE.

Early Applications of the Art of Mentation.—In applying this art to myself for the promotion of my researches, I first made a classified synopsis of every verified datum from all of the sciences which had any bearing upon the broad question of the study of the relations between body, mind and environment, and then, under the previously determined bodily and environmental conditions which were found favorable to productive mentation, I passed each such datum understandingly through my mind, and continued doing so, over and over again, several hours each day for some weeks, believing that by so doing I would not only render each of these data equally vivid in my apperceptive consciousness, but, that I would also by this repeated re-functioning of certain groups of brain-structures promote the growth and associative activity and elaborative processes of these structures and thus bring about superior mentative conditions more highly favorable to originative ideation and invention. Having been told by a critical observer of my work that there existed no proof that mental activity leaves any chemical or anatomical changes in the brain, I at once proceeded to experimentally determine the facts in the case, as follows:

As has often been described in public print, I conceived the idea of giving one group of animals an excessive training in the use of some one definite mental function, and of depriving another group of animals, of same age and species, of the opportunity to use this same mental function, and then, after a year of such deprivation and training, to kill both groups of animals and contrast their brains, both chemically and microscopically, to see if in those cortical areas, where that function is located, there would be any structural differences. I found that in the seeing-areas of the

cortex of an animal which had been confined for one year in a darkened room, there was no further appreciable development of brain-cells than was to be found in an animal of the same species at the moment of birth; and that in an animal of the same species, that for the first year of its life, had been trained in the extraordinary use of the seeing-functions, there was a far greater number of brain-cells than were to be found in an untrained animal of the same age and species that had not been deprived of light, and these brain-cells were larger and more complex. By this special process of mind-training, which it is the purpose of a special volume to describe, I succeeded, not merely in giving that animal more brain-cells in that part of its brain than any individual of that species had ever before had, but I also gave it more mind, in that particular direction, than any member of that species had ever before possessed. Similar trainings with other functions corroborated these conclusions, and the experiments teach what is the functional localization in the brain of any mental faculty and demonstrate that each conscious mental experience creates in some part of the brain a definite chemical change and structural embodiment of that experience, the refunctioning of that structure being essential to the remembering of that experience. This led to the beginning of an art of brain-building for the purposes of embodying more mind. Inasmuch as mind creates every science and art and constitutes the basis of all effort and of all enjoyment and suffering, it follows that to secure more mind becomes a fundamental opportunity and duty; and it follows that the animal organism is nothing more nor less than the mechanism for the manifestation of mind, and that evolution is a process of mind—embodiment—the embodiment being created by the mind's own activities. Quite recently I succeeded in showing that the same process is applicable to unicellular organisms. The simplest cell is capable of feeling a stimulus and of adapting acts to ends. Only Mind can feel and make such adaptive reactions. A cell remembers its experiences, and only Mind can remember. An inanimate piece of gelatine does not feel a stimulus and remember the meaning of such an experience and adapt acts to ends with reference to such a memory; but a piece of protoplasm can do these things, and therefore it is animate. It follows that Life is Mind, and that the vital or physiologic processes are simply psychologic processes. When unicellular organisms are caused to perform different mental activities correspondingly different structures arise in these cells; that is, if one group of cells is caused to feel and respond to some stimulus, and if another group of the same species of cells is caused to feel and respond to a different stimulus, and if these activities are kept up in both groups for several months, there will arise structural differences between these two groups of cells which correspond to the differences between their mentative activities. Even in these physiologic units it is the Mind which creates organic structure and regulates the metabolism. As is well known, all the organs of the human body are made up of cells, and each cell, as is shown by the above experiments, has its own mental life, and it is this mental functioning which constitutes its vitality. The conclusion is, that the physiological processes are explicable only as psychologic functionings. These experiments belong to the domain of psychologic biology, but these results have a deep medical meaning, namely, that the mind-activities create and control organic structures and the metabolisms upon which all organic changes depend. An animal is a mind-organism. The cells out of which an animal is built are mind-organisms, and the duties of each cell are duties that require mind for their performance. A cell cannot perform its functions in the animal economy except in so far as it is capable of *feeling* stimuli and in so far as it is capable of *adapting acts to ends*. To change the mental characteristics of a cell is to alter its physiologic meaning in the animal economy.

These experiments show the intimate connection between mind and cellular metabolism, and between the cortex of the animal brain and the rest of the animal body. Destroy some part of the brain and a corresponding part of the body must suffer. Improve some part of the brain and some part of the body will be benefited.

The meaning of this section is this: If mind-activities create chemical and anatomical changes in the cells and tissues of the animal body, it follows that all physiologic processes of health and disease are psychologic processes, and that the only way to inhibit, accelerate, or change these processes is to resort to methods of properly altering the psychologic processes, not merely of the cortex alone, but of each and all of the cells in each and all of the organs of the animal body. Of this later.

Later Applications of the Art of Mentation.—The experiments described in the foregoing section enabled me to improve the art of mentation, and then I applied the same art to myself in the further study of the relations subsisting between the body, mind and environment, and I was lucky enough to still a few more methods of studying the Mind. In the first place, the reader will remember, I discovered the art of promoting mentation by a proper regulation of the bodily and environmental conditions, and this led to the conclusion that the Mind of the human being is functionally connected with the Cosmic Whole, and that the human being is an organ in a Larger Organism. Then I applied this mentative art to myself in the further study of Mind, and discovered another method of studying the mind, namely, by causing animals to use some one mental function in excess, and by depriving other animals of the same age and breed of the opportunity to use that particular faculty, and then by contrasting their brains, I found that mind-activities create brain-structures; and that each kind of mind-activities create in some definite part of the brain their own kind of structures. I found also that in cells the mind creates structural changes and concluded that the cellular functions in the human body are psychologic functions.

A further application of the same art to myself, as above stated, led to further results, which I will briefly indicate.

The experimental variation of the environmental conditions, one at a time, and of the structures of an organism, one structure at a time, to see what effects such variations have upon the mental activities of all kinds of living creatures, constitutes what I have called Biologic Psychology. By variation of environmental conditions I mean such as those of temperature, moisture, barometric pressure, light, foods, etc. By organic structural variations, I do not mean those produced by mutilations and vivisections, but those which I produced by rapid processes of evolution and retrogression by a special method of selective propagation, etc., which I need not here describe. As new anatomic structures arose or disappeared in the organism, I noted the mental activities which simultaneously arose and disappeared. Thus my experiments in biologic psychology proved that every variation in environmental and structural conditions produces in all organisms, from the lowest to the highest, definite variations in the mental activities. A separate volume will describe these experiments, and at present it is my purpose to do no more than to indicate the conclusions that mental activities are causatively related to environmental and bodily structures and forces, and that every variation in any one of the structures or forces of the environment produces an inevitable variation of a definite kind in each one of the mental functions; and, also, that each variation in the bodily structures or forces produces a definite variation in each one of the mental functions. The relation between the animal structures and environmental conditions and the resulting mentation in any given organism is causative and quantitative. I have done much work in this domain, with new instruments and methods, and am convinced that when once these researches have been completed we will be able to predict the precise mental change which will result from any given environmental or bodily change. And the mind is not transcendently above these changes—it cannot function independent of structure. A vacuum cannot mentate—only a materially organized being can mentate, and such a being has its mentation causatively related to its structures and its physical environment. The medical aspect of these conclusions is obvious. By a proper regulation of the environmental forces and bodily structures the mind-activities of the cells of an animal body can be appropriately modified, and so can that *concensus* of the psychic activities of all of the cells of the body called the personal mind of the animal. Chemicals are environmental conditions; so are medicines and foods and radiant energy, and all of these affect the minds of the cells of which the human being is composed and thus directly change the physiologic processes by changing the constitutive psychologic activities of the cells.

Another line of work I have called Subjective Biologic Psychology. It consists of a variation of environmental and bodily conditions, one at a time, to determine the concomitant changes which occur in the consciousness of the pupil or subject upon which the experiments are made—changes known only to the pupil himself as he introspectively views his own conscious states. He thus learns, in the terms of his own conscious states, how each environmental variation and bodily condition affects his mind, and through the changes in his "physiologic" processes he learns how these environmental and bodily changes affect the minds of the cells of which he is composed. By the state of his mood and by the changes which take place in his consciousness, he learns to know what environmental and bodily variations have occurred. I allude not so much to the sanatory value of such an experience, as to the fact that it proves the organic connection of the mind with the Cosmos—that mentation, that is, vitality, and consequently all there is of health and disease, is a product of mind-activity as influenced by environmental and bodily conditions, and that when once we know the precise effects of each environmental and bodily condition on the mind we may utilize such conditions to fundamentally regulate the psychologic activities of the cells of the organs of the animal body, and thus promote health and cure disease by controlling directly that which constitutes life itself, namely, the psychic activities of protoplasm.

Still another line of research arose out of the application of the art of mentation to myself: namely, what I have called Sociologic Psychology, in which environmental conditions and the social anatomy of social groups of creatures are varied to determine what are concomitant changes in the group-mentation of these colonies or societies. The group-anatomy of an ant-colony, *e. g.*, is varied if they are supplied with slaves, or if the queen be removed, or if a bee-hive be deprived of its workers, etc. A social group of creatures, like a herd or tribe or mob, have a mental activity different from that of the individuals which compose it, and that is partly what I mean by group-mentation. Its dim beginnings are seen in the *esprit de corps*, in the class spirit of a college, in the enthusiasm of an audience, in social belligerent revolutions, etc. I can show that in every variation of the social anatomy of any group of people or animals, there occurs a corresponding variation in their group-mentation, which also affects the mentation of the individuals composing that group; and that every environmental change affects the group mentation. Here are the dim beginnings of a higher hygiene and social science; and also the germ of an important new principle in the attainment of highest health and in the cure of disease—social or group-mentation can aid in effecting desired changes in the individual mind, and these changes in the individual mind mean physiologic changes.

To briefly recapitulate: My first method of research showed the functional relation between the productive capacities of the mind along lines of invention and discovery, and the bodily and environmental conditions, thus disclosing the fact that the highest forms of human functioning, that is, of a human normal life, are intimately and interactively connected with the functioning of the

Cosmic Unit; and the three other methods of research, just described, also show the direct functional connection between the mind of an animal organism and all the rest of the universe in which that animal exists; so intimate indeed is that connection that every separate variation in kind or degree of each condition of the environment or of each structure of the individual or social organism produces a definite change in the mentation of the individual or of the group. Inasmuch as physiology consists of the psychologic activities of the cellular units of the animal body it follows that by properly varying the environmental and bodily conditions we can, if we know how, produce such variations in the mental activities of the cells of the animal body as to promote health and cure disease—because all physiologic processes, whether normal or abnormal, are shown to be psychologic processes of the cells which constitute the organs of that body. Biologic Psychology, Subjective Biologic Psychology and Sociologic Psychology comprise three great scientific domains wherein we can study, by new methods, the specific mental changes effected in organisms when we change their environmental and their bodily conditions or structures; and the systematic study of health and disease along these lines promises to inaugurate an epoch in scientific sanitation and cure.

But I was led to the recognition of still three other domains in experimental psychology, and these three branches of research are exactly the reverse of the three sciences just described. In the three sciences just defined the environmental and bodily forces and structures were varied, one at a time, in order to see what were the corresponding changes in the mentations of the animals experimented upon; but in the three branches now to be described just the obverse is done, namely, the mental activities of animals are varied, one at a time, in order to see what are the corresponding changes in the structures of the organisms of these animals and what the changes in their environments. The first of these three sciences, Psychologic Biology, consists in varying the mental activities of animals, that is, it consists in causing these animals to vary their own mental activities in order to see what corresponding changes are effected in their organisms and in their environments. The experiments upon brain-building in animals belongs to this science. As a separate volume will be devoted to this subject I do not propose at present to describe the experimental evidence upon which the conclusions growing out of my work in this line are based.

Suffice it to say, the evidence is complete which demonstrates that every mental activity creates a definite chemical change and a definite anatomical structure in the animal which exercises that mental activity, and that this is the *modus operandi* of animal growth and evolution, and that by this method more mind can be embodied *ad libitum*.

The evidence is complete which shows that every mentation also produces a definite effect upon the environment of the animal which does the mentating.

Action and reaction are equal. Force cannot come from nothing. Mentation is a mode of energy, and the organism of the animal cannot create the energy of life out of nothing, but must receive it from the Great Reservoir. But the conclusion that every mentation affects the environment is based upon direct testimony and quantitative measurement. Vary the mental activities of an unicellular organism and you will vary its structures, and the same is true of a multicellular dog or man. Mind underlies organic phenomena, and life is mind, and mind-activity is the cause of evolution, and mind-embodiment is the goal.

Pathology is abnormal cellular mentation. Disease in the liver will be cured as soon as the liver-cells mentate normally. Normal cellular mentation means normal metabolism, it means anabolism; whilst abnormal cellular mentation means katabolism and toxabolism. Cause the psychologic activities of cells in an organ to be normal and the mind-activity in these cells will create proper structures in the cells and proper metabolisms and nutritive changes. Psychologic biology proves that mind governs organic tissue and physiologic function because it creates these things and constitutes their life. To learn to properly regulate each of the mental functions means to become king in your own conscious domain.

Subjective Psychologic Biology studies mind by causing the pupil who is experimented upon to vary his own mental states, one at a time, so that he may determine the relation between these states, as they are known to him in his own consciousness, and the corresponding bodily and environmental changes which they produce. He will find that every mental state produced a definite effect upon every excretion and secretion and bodily structure, and then he will know by experience how to produce those conditions which promote health and cure specific diseased conditions. Thus, as I shall show later on, the mind of a human organism can by an effort of the will, properly directed, produce measurable changes in the chemistry of the secretions and excretions, in the vaso-motor blood supply to areas and organs, and in the temperature of selected areas of the body, and so on. All of this goes to prove that the mind has a direct effect upon the functioning of the cells which compose an organ, and that if we can learn how to properly train and use the mind we can produce definite effects upon any physiologic function.

Psychologic Biology studies mind by varying the mental activities of groups of individuals in order to see what are the concomitant changes in the group-anatomy and in their environment. Out of this will arise a higher hygiene and sanitation, and an important principle for the promotion of health.

The three sciences just described vary mental activities to see what changes are thereby effected in the organisms of creatures and in their environments. These sciences prove that mind qualitatively and quantitatively affects organic structure and environment—that mind builds the animal body and also builds the cells out of which that body is built; and also controls the chemical

changes which constitute the metabolism of these cells. It definitely offers experimental and irrefutable evidence that the life of a cell consists solely of its mental activities, aud that to embody more mind in a cell or animal is to embody more health and life.

These six sciences of mind have not been thoroughly worked. Far from it. The gateways to these wonderful domains have indeed been opened, but that is all. Mind creates every science and every art, and therefore the science of mind—Psychology—is the Science of the sciences; and therefore the art of using the mind and the art of getting more mind—Psychurgy—is the Art of arts. Mind is life. Life is not something different from mind. The life of a cell is its mind. The activities of a cell are psychologic activities, and therefore the regulation of the psychologic activities of cells and of multicells is the basis of the long looked-for fundamental law of cure. Therein lies the key to the mystery of disease and pain and evil, and therein, also, lies the Ariadne's clue to health and happiness and success.

I think no impartial mind can review with me the evidence upon which these conclusions are based and doubt for a moment that life and vitality and physiologic processes are solely mental processes. If so, then we are in sight of the Law of Health and Disease and Crime, and we see it not by faith or through mysticism and symbolism, but through the medium of verified facts which are congruous with the body of scientific knowledge, and the study of this law comes within the province of strictest scientific research. If we can know how to regulate mind-processes then we can cure disease—all disease. There are, as shown above, two great methods of varying and regulating the mind in an organism—first, by varying the environmental conditions and the bodily conditions of the organism and thus bring about modifications of the mental activities; and second, by causing the organism to voluntarily vary its own mental activities and thus change its bodily structures and chemisms and its environment.

Now I have done far too much work in each of these domains to attempt to give even an epitome of the experiments. I reserve such a description for several special volumes to be published sooner or later, and for the present I shall limit myself to an enunciation of the principles involved. I am rather outlining a proposed series of researches looking towards the cure of disease and crime, than attempting to describe what I have already done in these directions. My purpose heretofore in my life has been the discovery of the laws of mental action and the application of these laws to education, moral training, and to the art of properly using the mind in discovery and invention. Only during the past several years have I clearly found my mind outlining for itself the study of health and disease along these new lines which have as their standpoint the consideration of physiologic processes as fundamentally psychologic processes, and for the method, the direct regulation and control of the psychologic activities of the cells which compose the animal body. I do not mean the medication of the cell, but the acceleration and the retardation and modification of the mind-processes of the cells of the human body by means of any and all environmental conditions and forces, among which are chemicals, medicines, etc.; and by means of a direct training of the mind of the human being in the specific dirigation of each of the mental functions so as to learn how to use each conscious and subconscious process voluntarily for the production of known and definite effects upon the minds of the cells which compose an organ, so as to alter their likes and dislikes and other mental activities for specific purposes.

I propose, as will be hereafter explained, to study the effects of small doses of medicines upon unicellular organisms, to see how each different medicine alters the psychologic activities of these cells, and how, through this psychologic effect, the secretions and excretions of these cells are modified. When once I understand the action of various medicines upon simple protoplasmic bodies, then I will be better prepared to study the action of medicines upon the multicellular organism of an animal. Of course, always, when I say "animal" I mean to include man. I want this knowledge, not because I believe medicines can cure disease, but because I have demonstrated that medicines can alter the psychologic activities and characteristics of cells, and all the physiologic functions of a man consist of nothing else than functionings of groups of cells, and the life and functioning of each cell in such a group is definitely and solely a psychologic process. This is a new clue to experimental therapeutics, and I believe a much better one than has ever hitherto been pointed out. The law of similars, the law of contraries, the law of identities, the good there is in massage, in hydrotherapy, in electro-therapy, in metallo-therapy, in mind-cure, in faith-cure, in exercise, in dieting, in amusement, and so on through an almost endless series of pathies and isms with their countless series of applications, external and internal, as far as they affect amelioration or cure, are partial aspects of a more fundamental truth or law than either or all of them have conceived, and may we not expect to find this fundamental law in the study of the mind as manifested in cells and multicells, nay, is it not quite demonstrated that this law must be related to the regulation of the psychologic activities of the protoplasmic units of the animal body? If life and physiologic functionings can be shown to be a question of cellular psychology, then therein lies the hitherto unformulated law of cure!

The question resolves itself to one of regulating and controlling the mind-activities in cells; and this can be done, as far as science knows, in the ways described in the above-mentioned six psychologic sciences. And such control of cell life is not a matter of faith and belief, but of knowledge and technical appliances, and by following rules quantitative in their character. A scientific study needs to be made of the precise effects of each environmental condition upon each kind of mental function in a single cell or in an animal, and then we will know just how to apply these conditions to the cure of disease. Likewise, a

scientific study needs to be made of the precise effect which each form of intellection and emotion and sensation has upon a cell's psychic activities, both as a single isolated cell and as a cell in an animal body, and then a study of how best to train a patient to produce these mental conditions and how to direct them to the right organ or spot; of these things I will later on give examples. The fundamental law for the cure of disease and crime is a psychologic law; and the theater of its action is within the protoplasm of a cell; and the force upon which the action must be made is that of the psychologic activity of the cell; and the means by which it must be made is by a regulation of the physical and psychological conditions of the body and of the physical and psychological conditions of the environment. The only way to discover the precise applications of this law is by experimental determinations of the effects of definite physical conditions of body and environment upon the personal mind and upon the cellular minds of the patient; and also to determine the definite effects of each form of mental activity of the personal mind and of the cellular minds of the patient upon the physical conditions of the body of that patient and of his environment. Here lies one of the most glorious opportunities ever offered to the scientific investigator—who shall be privileged to carry it out to conclusions and results?

PSYCHURGY AND MEDICINE.

Out of the science of psychology there arises a corresponding art which I have called psychurgy. Psychurgy is the art of getting more mind and the art of most efficiently using or utilizing all of its possibilities. The first step in the art of mind-embodiment is that of brain-building; the next is that of education in special knowledges; and the next is that of moral training and the curing of immoralities—these three steps constitute the first great branch of psychurgy. The second branch relates to the arts of conscious, sub-conscious and cosmic mentation; and has for its purpose the discovery and the application of Truth. Of this second branch I shall say no more in this paper, except to state that the art of mentation is the primary method of these researches. In the fullest sense of the word organic evolution is a process of mind embodiment, and even in the Darwinian method of survival of fittest the creature which actually survives is the one in whom the processes of mentation are most perfect. It must be remembered that what has been called "physical" labor is in reality mental labor; even the contractility of the muscles by which so-called "physical" labor is accomplished is a psychologic process in the muscle-cells. To throw a shovelful of dirt just so far, and no farther, requires a mental co-ordination; and the process by which the muscle-cells feel the stimulus which causes them to contract at a certain speed and with a certain degree of energy is also a psychic activity. The animal which can most quickly detect danger or opportunity, and which can most quickly and perfectly adapt acts to ends is the animal which, other things being equal, always survives. The higher process of civilization differ not in kind, but only in degree, from the activities exhibited by a piece of protoplasm, and the method as well as the goal of human progress is the discovery and the application of truth by mentative processes. In the animal organism any given organ attains its full health and maturity only when it can normally exercise its functions, neither too little nor in excess, and any deviation from this normal exercise at once constitutes a pathologic condition. When any one organ increases in activity, and consequently in growth, it at once requires more blood and metabolism, and it follows that all other organs in that same organism must at once receive less blood and become less dominant in consciousness. That is, all of the organic functions in an animal organism become modified with reference to any other organ whose functioning becomes temporarily or permanently dominant. This is the law of functional correlation. Now the same is true in a higher sense when we consider man's organic relations to the sum total of living things upon the earth. All living things have differentiated out of the earth, and are materially and dynamically part of the earth; and as I have elsewhere shown, all living things are in psychologic functional connection. In proportion to the degree of mentation every living thing gives off electric waves and other kinds of waves, and these forms of radiant energy falling upon other living things at once modify their mental processes. This constitutes a physiologic oneness between all living things, so that no living thing can become mentally active without reciprocally affecting all other living things. In this larger cosmic organism each living thing is an organ, and its functional use in the achievement of progress for itself and others is the discovery of the truth about the things in the midst of which it lives, and the application of this truth to the amelioration of its conditions—that is, the discovery and application of truth is the normal purpose of the functioning of the individual, and in the largest and best sense, when such functioning becomes dominant in any one individual all human affairs begin to shape themselves with reference to such individual dominances. Only in the exercise of discovering and applying truth can man attain his highest health.

Brain-Building and the Cure of Disease.—In organizing a series of systematic researches into the nature and cure of disease, the first step, and in many respects the most fundamental one, consists of the study of brain-building as a method for securing the completest and fullest development of the organs of the animal body. There is abundant clinical evidence, well known to modern surgeons, which supports the view that every part of the body is in intimate nervous connection with certain definite parts of the brain and spinal cord; and it is well known that when these centers in the brain or cord become injured by lesions that the corresponding parts of the body at once begin to atrophy or become otherwise diseased. The rationale is this: If for the first time a muscle of the arm in an infant is moved consciously, so that the child feels the muscular sensation which is normal to such a movement, there at once takes

place a transmission of that muscular feeling through a nerve fibre to the cerebral cortex in the region of the fissure of Rolando, and the sensation produces a deposit of chemical matter in the cortex of this region, and that chemical accretion remains as a structural change in which the memory of that sensation is embodied. All of the muscular sensations derived from the muscles of the arms are enregistered in the arm-areas of the cortex, and out of this arises muscular skill and habit. As is well known, pressure upon these arm-areas temporarily destroys the power of the patient to use the arms in any familiar work, such as playing the piano: or buttoning the coat, or opening a watch, and all memory of the muscular movements of the arm ceases. If an ulcer destroy this portion of the brain the power to use the arms is permanently lost. As is well known, if the occipital portions of the cerebral-cortex in the region of the cuneus becomes destroyed, there is loss of sight, and if the temporal cortex of the cerebrum is destroyed there is loss of hearing, and so on. If destruction of cortical areas produces disease of corresponding organs may we not expect that strengthening and up-building of these areas will produce development and health in these organs? Furthermore, I have shown by experiments upon animals, and the experiments have been widely published, that systematic exercise of the sensations of touch, pressure, muscular feeling, warm sensations, cold sensations, etc., produce an enormous development of the cells of those parts of the cerebral-cortex which are connected with those parts of the body upon which the experiments are made, and that not only does that part of the brain grow larger, but the corresponding parts of the body become more highly developed.

Animals confined in darkness for a year or more after birth have a deficiency of brain-cells in the seeing-areas and the eyes are correspondingly weak and imperfect; the subsequent training of the eye-sight produces cellular development in the brain and corresponding development of the eye. Disease of the cortical area in such a dog soon destroys the eye. In an infant whose arm was torn off at birth by an unskillful obstetrician, there was of course no capacity to acquire sensation memories with that arm. The child died at eleven years of age, by accident, and an examination of its brain showed that the left arm-area of the cortex was deficient in brain-cells while its right arm-area contained a little more than the average number. Mr. K., sixty-eight years of age, had a left arm that had not grown in size since the fourteenth month of his life, owing to sequelæ from scarlet fever, and he had not moved any portion of the arm or hand during all these intervening years. I began by giving repeated sensation-memories of touch and pressure upon every portion of his arm and hand at regular intervals for six weeks, being careful to gradually increase his power to distinguish lighter and lighter touches and pressures. This practice built a great number of additional cells in the corresponding of this cortex. Then I caused him to discriminate the least distance between two points of touch upon all portions of his arm and hand, using the caliper æsthesiometer for the purpose. He gradually acquired increased power to distinguish as two touches points which were gradually brought closer and closer together. Having placed a weight upon an area of his arm, I found by experiment what was the least additional weight which he could detect.

In a similar manner I trained the temperature sensations of all parts of his arm and hand, using for the purpose small bags of thin rubber, filled with water at different temperatures. This training produced an additional number of brain-cells in the temperature areas of his cortex. In order to get muscular feeling I had to resort to a special method. I introduced a platinum probe beneath the skin, and insulated from the skin by means of a rubber coating upon all parts of the probe except the point, and applied an electric current to the nerve which ramified into any given muscle, and this caused the muscle to contract. He was unable to voluntarily move a single muscle in the arm. By this means I succeeded in giving him muscular feelings and in building in the arm-area of his brain a number of additional muscle-memory-cells. After several months of effort his arm had grown to a little more than three times its former size, and he could move each of the fingers and bend his arm at the elbow, and at this point I quit the experiment. Six years ago he died, and an examination of the arm-areas in the right cerebral-cortex revealed the existence of an enormous number of young and well-formed brain-cells. The existence of a greater number of cells in a cortical area permits of a greater amount of libero-motor discharges from the brain to the parts of the body therewith connected, and a vervous stimulus which comes from the brain to a peripheral organ regulates the vaso-motor dominances and metabolisms of those parts to which the stimuli are sent.

Those areas of the brain which are prevalent in a normal amount of cells cause a like deficiency in the development of some corresponding part of the body, and a normal bodily development is possible only when there is an equal development of all the cortical areas. An ataxic development of the cortex will cause an ataxic development of the body. The scope of this article will not permit the giving of more than one example under each case, but I desire to call further attention to the fact that the brain centers govern directly every part of the body and that if these brain centers are normal in their activity the corresponding bodily parts will be normal. As a matter of fact, the brain is in direct or indirect contact, by means of fibres, with all the cells of the body.

In order to determine the precise effect which the development of any particular part of the brain produces, it will be necessary to apply brain-building to animals in such a manner that a definite part of their brain can be builded by the exercise of a very definite class of mental activities and then to carefully note the effect produced on different parts of the body and particularly upon the excretions and secretions. Only after a complete series of such investigations have been made will it be possible to reduce to rule the art

of curing disease by the rebuilding of the brain. Such a series of researches would require at least five or six years of time and special facilities, but the importance of this line of work is co-extensive with the interests which the human race has in the subject of health and disease. It is my plan first to apply the method to single cells in order to determine the precise structures which the cellular activities create in the cells, so as to learn about functional localization in the cells, and so as to determine the character of the changes which the different cellular mental activities produce in their own protoplasm. When mind-building in cellular life has been thoroughly studied, we will be better prepared to study multi-cellular life.

The general conclusion to be derived from what I have said about brain-building, and from the experiment upon Mr. K., is that the law of cure must be a *psychologic* one.

Moral Training and Curing Immoralities.—In the highest sense an immoral memory is a mental disease. By means of intellection we acquire a knowledge of the outer world, that is, we acquire sensations, images, concepts, ideas, reasons and thoughts, by means of the intellectual processes. By this means we learn about things outside of ourselves, and inasmuch as these things affect us either for good or for bad we soon acquire emotional feeling with reference to the same, and this feeling may belong either to the love-emotions or to the æscetic emotions or to the moral emotions. Out of these good and bad feelings and emotions with reference to a given thing arise our likes and dislikes and our entire moral disposition. Every false image or wrong concept or untrue idea votes in every conclusion we make, and every immoral emotion directs our interests toward wrong channels. That is, immoral memories are processes of mind disembodiment, because they prevent a proper adaptation of acts to ends, and because they antagonize the discovery and application of truth. Every immoral memory and every wrong emotion is an obstruction to the embodiment of more mind, and hence from the largest ethical standpoint a man cannot be perfectly normal, that is, he cannot be perfectly healthful until he has eliminated from his mind all immoral emotions and memories.

My experiments upon the effect of the emotions upon the excretions and the secretions have been quite extensively published, but I will briefly epitomize the results which I obtained. Analyses of any of the excretions or secretions from a person who has been angry for half an hour shows the existence of certain ptomaines and catastates of a poisonous character, but these poisons are different in kind from those obtained from the secretions of a person who has been sad for a half hour, and so on with the different evil emotions. The irascible, the depressing, the malignant and the fearful emotions create poisons in every cell of the body and produce catabolism; while the good emotions augment the nutritive changes in every cell of the body and augment anabolism. Emotion exerts a profound effect upon the chemical changes which take place in the protoplasmic contents of cells. The emotions modify profoundly the changes in the vaso-motor circulation of the blood. Every physician has observed how quickly happiness and good news promote the digestion and the sleep and the general good appearance of a patient; and how quickly grief and bad prospects blanch the face and lower every vital function. The intimate connection between emotion and metabolism is obvious. But metabolism is simply another name for cellular mentation. As far as emotion is useful in the cure of disease, it is evident that its effect is upon the psychologic activities of the cells of the body.

A criminal personality may be considered to be a moral disease. The sexual pervert, the kleptomaniac, the child of vicious temper, the person without natural affection is an abnormal person in the sense that certain parts of the mind are either lacking or are functionally abnormal.

The process used at this institution to cure a criminal propensity may be instanced as a further proof that the fundamental law of cure is a psychologic one. The first step in curing a criminal consists in discovering by psychologic analysis the number of wrong sensation-memories and wrong image-memories and other wrong intellectual and emotive memories; and then by a process of brain-building to put into the same parts of the brain where the wrong memories are another series of good memory structures consisting of normal and scientifically acquired intellectual and emotive memories relating to the same objects and acts as those from which the wrong memories were acquired. This puts a large and dominant number of normal cells in the very areas where the evilly functioning cells were, and then these new structures are kept functionally active oftener each day than the evil ones can have a chance to be active, and the result is that the new structures not merely become dominant anatomically and dynamically but also psychologically. The child's disposition is remade—the child is psychologically reborn. It has acquired new likes, and the wrong which it previously liked it now neither likes nor dislikes. A criminal propensity is a dominancy of evil memory structures, and as soon as a larger number of morally functioning structures are put in the same part of the brain there arises a new dominancy, and if this new dominancy is kept active it will take the blood away from the old structures and cause them to atrophy. The time will come when criminals will not be allowed to grow up as criminals, but the state will see to it that criminally inclined children are cured during early school years. This experiment again shows the law of cure to be a psychologic one, and it also shows that the psychologic effect must be made upon the psychic activities of the cells of which the human body is composed.

It will be desirable to more carefully explain what I mean by brain-building. When an incident cosmic stimulus such as light or sound or pressure affects a sensory nerve-ending there results a sense-impression upon that nerve-ending, but this sense-impression is not yet a sensation. Certain transformations of energy must first take place in the nerve-ending, so that out

of the sense-impression there arises a kind of transmissive force, called nervous force, which travels from that nerve-ending along a nerve fiber, stopping and being further transformed at many intermediate sub-cerebral stations, it finally reaches the cortex and produces at or near the termination of the fibrous track a series of chemical and electrical changes; and when these changes have been effected there results a conscious sensation. This conscious experience is embodied in the structure which has just been formed, and the refunctioning of that structure is the essential basis of memory. The refunctioning of such a structure causes it to send out from itself electric and other forms of waves through fibers and brain tissue to adjacent cells, thus stimulating them into associative activity. All sensory nerves have endings in the cortex, and each class of sensory nerves have assigned to them a definite area of the brain's topography. The same is true of the feelings which come from the different internal organs of the body, but their functional locations have not yet been determined. The first step in brain-building consists in the acquirement of sensation memory-structures, and if a human being were born without any of the nine kinds of sensations that person would never know of the existence of an outside world The first step of mind-embodiment, the first revelation which Cosmos makes to human consciousness, is made by means of sensations; and if any of the sensory activities have not enregistered in their particular parts of the cortex the completest possible number of brain-cells, then that part of the brain will remain fallow and the corresponding part of the phenomena of the universe will not be functionally represented in that person's mind. The result will be a mind with some of its parts left out, that is, it will be ataxic. The second step consists in integrating the sensory units of consciousness into the next higher conscious element, that is, into images. The next step is to taxanomically integrate images into concepts; and the next step consists in relationing concepts with each other in order to arrive at ideas, and so on, through the stages of reasoning and the different orders of thinking. A large volume is required to describe the art of brain-building. The essential part of the process, from the curative standpoint, depends upon the capacity of the teacher to produce in the pupil a uniform enregistration of the different memories and also to omit from the general process no kinds of mentative memories. To properly develop any class of sensation memories, each sensation of that class should be repeated every day, and at the same hour each day, and for at least six succeeding days. And no sensation should be repeated oftener than any other one. The same is true of images, concepts, ideas, etc. A second important thing to be remembered is that every enregistration should be pleasurable. If the totality of our conscious experiences with any object or phenomenon are pleasurable then our state of mind toward that object will be one of liking or of agreeable æsthetic or moral feeling, and our affective state, which includes all of our experiences with that object, will be accompanied by emotional conditions which are wholly agreeable and life-promotive. Before I commenced my work upon the relations between the emotions and chemical changes in the cells, it was customary to call all of these changes of a nutritive or disruptive character by the name matabolism. Those changes, which are life-destroying and which resulted in a loss of tissue and energy, were called catabolism, while those changes which resulted in the gaining of strength and tissue were called anabolism. The corresponding products were called catastates and anastates. I discovered that depressing and evil emotions augment catabolism and produce catastates, and also other still more highly poisonous products which I called toxastates; and that the exhilarating and happy emotions augmented anabolism, and produced in addition to anastates another class of products which I called eunastates. Now if the affective state of the mind toward any object or phenomenon is devoid of a concomitant of unpleasurable sensations and evil emotions, the refunctioning of the memory-structure of that experience, either consciously or subconsciously, promotes anabolism in all the cells of the body; but the presence of any evil sensation-memories or emotion-memories produces catabolism.

We may compare life's memories to a garden in which have been planted both weeds and flowers; if we repeatedly water and fertilize the flowers and not the weeds, the time will soon come when the weeds will disappear. If we systematically dirigate into conscious activity the anabolic memories of any affective state, or group of such states, the structures in which these good memories are embodied will soon receive all the blood and growth and the adjacent evil structures will atrophy. I think it will be apparent that a normal life must be more than a merely intellectual life—it must be equally well developed in all of those tender emotions and æsthetic emotions and moral emotions which constitute the religious nature of the individual. Successful scientific research is as much a product of the moral nature as of the ratiocinative processes. As long as any one group of structures in the cerebral cortex, either of an intellectual or emotive character, have not been enregistered, the mind will be dystaxic and the health will be incomplete.

I will give one experiment to demonstrate the connection between brain-building and the functioning of the internal organs. I will premise by saying that each organ of the body is composed of cells which have their own mental activities, and that these mental activities differ in their characteristics from those of the cells of other organs in the same body, each group of cells having special capacities and special kinds of labor to perform for the common good of the organism in which they are social units. The cells of an organ must be capable of feeling a stimulus sent to them, and it must be remembered that only mind can feel; and these cells respond to this feeling by adaptive actions and perform certain results in accordance with the custom which has arisen out of their previous experiences—such

phenomena are mental phenomena, and the functioning of an organism may be described as the group-mentation of a society of cells. To demonstrate that such groups of cells can be educated and then deceived, and then re-educated, I made the following experiment: Two shepherd dogs were fed milk containing enough Annatto to render the milk just perceptibly yellow, and enough tartar emetic was put into the milk to give them nausea almost to vomiting. After several repetitions, although thirsty, they refused to drink the milk and the sight of it caused them to indulge in those well-known expressions which a dog makes at a nauseous object. In order to make a still more profound impression upon them I began to feed them milk in the dark, and while they were drinking the milk colored yellow and containing the emetic I turned on the light so that they might see what they had been drinking, and thus associate that color in the milk with the nausea which would immediately follow. Thereafter they refused to drink milk in the dark. Before describing the rest of the experiment I wish to remark, that by this process I had been giving to that part of the brain and solar plexus and other sub-cerebral centres, a series of memory-structures that were catabolic and which caused the affective state of the dog toward the milk to be accompanied by feelings of nausea whenever he saw the milk and by an emotion of dislike. To show that these memories have an intimate connection with the functioning of the stomach, I made still one more experiment. I began to give the dogs milk just about dusk, but without either coloring it or putting in it an emetic, and thus they were soon led to freely drink milk in the dark. I then gave them milk colored with Annatto, which substance has no action upon the dog, and while they were drinking the milk—they had become accustomed to it for several weeks—I turned on the lights so that they could see what they were drinking. Now this milk contained no emetic, but as soon as they saw its yellow color they immediately stopped drinking and began to vomit. The re-functioning of the unpleasant memory-structures acted directly upon the stomach of the dog in a manner similar to the emetic, that is, the stomach-centres of the brain had been educated to believe that yellow milk was nauseous. Every such catabolic memory interferes with normal digestion. About three weeks thereafter I again began to feed them milk in the daylight, and gradually colored it to a deeper and deeper yellow, but without putting in the emetic; and in four weeks' time I succeeded in getting the dogs to drink yellow milk, and because of a small amount of sugar that I placed in the milk that had been colored yellow they soon began to prefer it to milk not colored yellow; and by placing small amounts of emetic in the uncolored milk, I soon got them to dislike the normal milk as much as on a former occasion they had disliked the yellow milk.

Mrs. M. had been suffering for nine years from dyspepsia, consisting not so much of gastric inability as of improper assimilation. I gave her a systematic series of training in pleasurable odors and perfumes and tastes, and a systematic series of remembrances of pleasurable gustatory and other hunger-feelings and thirst-feelings, giving the training at the same hour each day every day for two months. The result was a complete restoration of her assimilative powers and a gain of twenty per cent. in weight—she had been very much emaciated—and of more than thirty per cent. in strength. The additional brain-cells which I thus placed in the cerebral areas of the gastro-intestinal tract caused the brain to send more and better stimuli to the digestive organs and thus bring about the cure of her disease. I am not a practitioner and I do not take patients for pay nor for any other purposes except for experimental research, neither do I repeat an experiment after I have once satisfied myself of the truth of the general result.

Mr. L. was unable to distinguish as small a color-difference with the left eye as with the right eye. By producing upon the eyeball and its supplementary integuments a series of systematic sense-impressions of the different kinds, and by giving him sensations upon that eye of many thousand tints, shades, and hues of color which he had never before consciously discriminated, and without trying to test his capacity to discriminate the differences less than those which he had previously failed to recognize, I was able in seven weeks to produce, by means of brain-building of the seeing areas, a greater power of discrimination in that eye than in the other one which was previously most acute.

The conclusion which I wish these experiments to emphasize is that the functioning of a bodily organ can be wholly changed, and its abnormal functioning cured by means of nervous stimuli sent to these organs from their corresponding brain areas, and that, therefore, the change must be effected by the action of the mind upon the psychic activities of the cells of the organ.

Dirigation.—By dirigation I mean the voluntary power of the individual to confine his consciousness exclusively to the feelings and sensations which may be noticeable in any selected part of the body, and by practice to send to those parts more blood, and to alter therein the lymphatic and thermic functions. If I confine my attention to my thumb and inhibit my attention from all other sensations and feelings in other parts of the body, and from all intellections and emotions which may tend to spontaneously arise in the mind, and if I thus continue to rivet my attention to my thumb, I soon will become aware of an *increased amount of feeling in that organ.* If this is continued for some minutes a sense of fullness and pressure arises, and a delicate thermo-electric thermometer will record the fact that the temperature in that thumb has risen a fraction of a degree centigrade higher than the temperature in the other thumb; and if a plethysmographic measurement be made of the volume of the thumb to which dirigation is made it will be found to have become larger than the other thumb.

I have elsewhere published an account of these experiments, but I will briefly repeat them. Into a glass vessel, wider at the bottom than at the top, I introduced my right arm and filled the vessel

with water and allowed the arm to rest in the liquid, without motion or any straining of the muscles. Without making the slightest movement I began to dirigate to the right arm. The vessel had previously been filled with water so that the addition of another drop would have caused it to overflow. The water was at the temperature of the arm. After eleven minutes' dirigation I succeeded in becoming conscious of nothing but the feeling of sensation in that arm, and shortly thereafter the water began to flow over the top of the vessel, and in twenty-one minutes six hundred grains of water had been displaced by the augmented volume of my arm. Then I dirigated to the other arm, forgetting all about the right arm. It took some time for me to lose consciousness of my right arm. Those parts of my brain in which the right-arm sensations were enregistered had become functionally active and filled with blood, and it took some time for the blood to leave those brain-areas and also for the blood and metabolism to cease their dominant functionings in my right arm. We may call this phenomenon *functional persistence.* That is, a functional dominancy tends to maintain itself. After some minutes of effort I succeeded in overcoming the functional inertia of my right arm and to get a functional dominancy in my left arm and in the corresponding brain areas. Now my left arm had previously been placed in a similar apparatus and after some further effort the water began to assume a lower level in the vessel in which the right arm was placed, showing that the right arm was shrinking in volume; and the water began to run out of the top of the left-hand vessel, showing that the left arm was augmenting in volume.

By placing a surface thermometer upon any part of my body I can in from five to twenty-five minutes raise the temperature of that part of the body by persistently dirigating to that part. I can also alter the character of the perspiration of that part, and by continuous dirigation to any one part of the body it can be caused to grow larger in size than the other corresponding part of the body.

Mrs. K., of Philadelphia, having previously been trained in the art of thus dirigating to any part of the body, was the subject of the next experiment. She had an almost entire absence of the mammary glands and by dirigating continuously for one hour each forenoon and one each afternoon to the left gland it became in fourteen weeks of a size more than four and a half times larger than the right. She then dirigated to the right gland and in nine weeks it became of the same size as the left.

Mr. F., in a similar manner, dirigated to his left arm, and to that part between the shoulder and elbow, and in four months it had increased 6 per cent. in its circumference, and the strength of the muscles in that arm had been greatly augmented. I tested my hand upon the dynamometer several times each day for six consecutive days so as to find the utmost power of my grip; then I dirigated to the muscles in my hand five or six times daily for two weeks, but without using my hand in any form of muscular exercise whatsoever, and at the end of that time the strength of my grip had been increased 16 per cent.

Mrs. S., afflicted with severe chronic constipation, had to have the stools mechanically removed every other day for over two years. Of course, all usual remedies had failed, including the various enemas and massage. I began by giving her sensation-memories of touch and temperature in that part of the rectum which lies below the sigmoid flexure. This was done by means of warm and cold water-sprays, which were gradually increased in coldness and warmth up to the point of giving pain, and the warm and cold sprays were rapidly alternated. This process created, in the corresponding parts of the brain, the sensation memory-structures of the sensations which I had succeeded in producing in this atonic part of her intestine, and the libero-motor discharges from those brain structures to the rectum enabled the brain to send more blood and metabolism to those parts; but the main object of this training was to enable her to get enough *feeling in those parts so that she could dirigate thereto.* She was then taught the art of dirigation and four times a day she dirigated to the rectum and in eleven weeks she was perfectly normal.

The next step in the art of dirigation consists in repeated practice so as to be able to get the fullest and completest feeling in any part in the *shortest possible time* and this should be practiced with reference to all parts of the body. This practice gives the pupil skill in willing the dirigation and it also gives the person a marvelous control over the body—the mind takes, as it were, conscious possession of parts over which it previously had but little governing power, and the health of every part of the body is augmented.

The next step in the practice of this art consists in securing a change of dirigation from one part in which the dominancy has already been established to some other part of the body, so that the full change may be completed as quickly as possible and completely as possible. This develops the power of the system to center all of its forces upon any one part and augments its capacity for correlation of functions. For example; after such a dirigation to a bodily area the sudden exposure of the body to a draft of cold air will be much more quickly followed by a vaso-motor sending of the blood to those parts so as to prevent chill.

A still further practice develops the power to differentiate the feeling which arises in the dirigated part and what was previously a simple sensation becomes a more complex state of feeling, that is, *several sensations* can be discriminated instead of one, and if the pupil dirigate to a particular one of these sensations a different result is obtained than if the dirigation be to some other one of these sensations, and at this stage arises a complex state in the art, requiring a small volume for its description.

It is well known that in the hypnotic subject the attention can be confined and directed in such a way to different parts of the body so as to render them insensible or to produce other interesting effects. But hypnotism produces evil results in

the brain and I think that the testimony of scientific experiment is such as to prove that hypnotism is nearly always dangerous and should be used only when it is a choice between two evils. One skilled in the art of dirigation can accomplish much more profound effects and without the danger of hypnotism. I first studied this matter in 1876 and made my most important experiments in this line about 1890, especially the experiments herein recorded. I have been able to show that by dirigation it is easy to produce an action similar to that produced by most drugs. Thus, it is very easy by dirigation to produce emesis and even sudoresis. A tribe of American Indians, whose name I have forgotten, can vomit at will. I had one patient who could produce in twenty minutes catharsis, and another who could in two minutes' time produce upon most of the surface of his body either pallor or blushing. There are many people who can shed tears at will. I simply call attention to these facts to show that in a scientific art of dirigation there lies a marvelous power over all of the functions of the body.

In connection with brain-building the art of dirigation opens an entirely new field for the cure of disease and the study of the subject is of imperative importance.

A systematic series of researches upon the effects of dirigation of different kinds to different parts of the body by persons properly trained, constitutes one of the lines of researches soon to be commenced in this laboratory. It will involve a careful psychologic measurement and a careful analyses of the excretions and secretions, so as to determine the precise effects of particular dirigations.

Medicine and Cellular Mentation.—An incidental line of research consists in studying the effect of medicines upon the psychologic activities of the individual cells which constitute the animal body. I do not mean on pathogenic germs in the body. This is a small part of the larger subject, described in the first part of this paper, which has for its object the experimental variation of environmental conditions to determine what effect these variations have upon the mentations of an organism. I have shown that mentation is the product of two factors, one of which is that of the organism and the other of which is that of the Environmental Whole, of which that organism is a part. I have shown that every variation in the physical conditions and forces of the environment and in the body produces a definite variation in the mental activity, and *vice versa.* Now one of the environmental conditions capable of affecting the mind of a cell is the presence of medicines and other chemicals. I do not allude to their chemical action upon the organism, nor to their food value, nor to their so-called drug-actions as astringents, tonics, etc., but to the *actions of these medicines upon the minds of the cells of the tissues of the body.* If the uni-cellular organism has for some time been watched under the microscope the observer will become acquainted with the habits of its life, and by experiment it can be learned what are its likes and dislikes, and what are the stimuli to which it responds, and what are the precise ways in which it responds to a given stimulus. By chemical methods we can also learn how the excretions of the cell vary under the influence of different mental activities. When to such a cell a small amount of medicine is given for a long time it will be found that its mental activities have been modified. Thus I can easily obtund its sensibilities in different ways by different narcotics and anæsthetics, and stimulate its activities by excito-motors, but such changes belong to the class of drug-actions and I do not in this paper refer to such an effect. But when I place in the liquid medium in which the cell lives most astonishingly minute doses of certain organic alkaloids—less than the one hundred millionth of a grain a gallon of water—I find that the mental activities of the cell undergo a slow change, the foods which it formerly liked it commences to reject, and the foods which it formerly refused it commences to eat, and stimuli have different effects upon it than formerly. Of this I have abundant experimental evidence. A careful study of the psychic effects of medicines upon uni-cellular organisms is what I propose to undertake before I commence to study the effects of medicines in small doses upon the psychologic activities of the cells in the organs of the human body. Medicine cannot cure disease, but medicine can *effect, for good or ill, the mind of a cell* and thus lead that cell to perform those functions which will bring about the cure of the disease in question. Of course, in addition to medicines there comes the whole question of foods and radiant forces, for they also affect cellular mentation, and they must be studied in the same general manner as those proposed for medicines.

Technical Facilities.—When some months ago I began the study of disease and health from the standpoint of these new lines of investigation, I did not in my most ardent moments anticipate that I would have such excellent facilities with which to carry on these researches. As is my usual custom, I applied to the subject the art of mentation and trusted entirely to the results which my mind would produce when under properly regulated bodily and environmental conditions. I applied each function of my mind to each datum of the previously collected sum of human verified knowledge upon that subject. I was very much pleased to find that the first results were in the line of new instruments of research. I first succeeded in inventing a method to get increased magnification and resolving power with the microscope, and this makes possible the study of the minute anatomy of the units of the cells themselves.

The New Double Microscope consists in applying a second microscope to the already magnified image of the first microscope in such a manner as to get not merely increased magnification but increased detail. I have also applied a third microscope to the second, and there is no limit to the possibilities of magnification and resolution except that of the limits of photography.

But New Photographic Technique, recently discovered while at work on my microscope, enables me to photograph with less than the one hundred thousandth part of the amount of light for-

merly necessary, and this extends the range of photo-micrography up into millions of diameters, and opens entirely new domains in histology and bacteriology.

A New Microtome enables me to make slices of tissues very much thinner than has heretofore been possible, in fact I can divide a cell into several hundred separate slices and this enables the microscope to see, without defraction of light through the substance of the cell, the more delicate internal structure of its different parts.

A Parallel-Beam Reflecting Microscope enables me to view the upper surface of an opaque object and to get details hitherto unattainable, and by use of light of proper wave-length I can see a short distance beneath the surface of most opaque objects, and even to see microscopically a muscle cell through the three skin layers of my finger. This is a device of great promise.

An Insulated Isolation Chamber consisting of three rooms, one within the other, the walls of which contain substances which screen out from the inner room all outside environmental influences, enables me to make psychologic measurements in an unchanging environment, and by admitting one environmental force at a time can determine its effect upon each of the mental faculties.

A Microbnometer enables me to measure the cubical contents of a blood cell or of a bacillus.

And many other special devices, in addition to the usual psychologic and biologic apparatus, are at hand ready for these investigations.

To recapitulate: The foregoing article has designed to impress upon the minds of my readers the conception that the human body is an integral functional part of the larger cosmic organism and that mentation is the result of the inter-action of these two factors; I have endeavored to show from the standpoint of psychology that what has hitherto been called the "vital" and "physiological" processes are in reality psychologic processes, and that the life of a cell is nothing more than its mind; and I have shown from the basis of psychurgy, that by *brain-building* and *immorality-curing* and *dirigation* the personal mind of the human being can directly modify for good or for ill the psychic activities of the cells of the organs of that human being; and, finally, to demonstrate by experimental and other evidence that the fundamental law of cure is a psychologic one, and that the place where it must be applied is upon the minds of the cells out of which the human organism is built; and that there are two general ways to make this application, namely, first, by a variation of the environmental and bodily conditions; second, by a variation of the mental activities of the personal mind of the organism.

The object of this paper has been to show that such researches should be made and to indicate the proper method of making them. By environmental conditions I mean all of the physical things and forces other than those which constitute the human being, such as light, electric waves, sound, chemicals, and so on. By bodily conditions I mean the structures, substances and forces operative *in* the organism. Every bodily and environmental condition should be applied, one at a time, to uni-cells and to multi-cellular organisms in order to determine the precise mental effects which they are capable of producing. Likewise, every form of mental activity should be studied in its effects upon the organism of the cell and multicellular organism. Only through such a series of researches may we ever expect to achieve the concrete formulæ and the rules for the cure of disease by strictly scientific methods, and for the attainment of highest health. The conviction has been steadily growing in the minds of scientific observers, that medicine is not a science, and that with the exception of surgery and sanitation it is not even a rational art. Each of the many systems of therapy and cure contains some small elements of truth, and if a fundamental law is ever achieved these separate successes of the present different systems will be found to be small aspects of a much larger truth.

No one who has witnessed the experiments in brain-building and dirigation, or who has practised the art of mentation, or who has seen the experiments upon cellular mentation, will for a moment doubt but that the secret for the cure of disease and the attainment of health is to be found in the study of the effects of forces and mental activities upon the minds of the cells in the animal body. Hence this paper may be considered to contain a first statement of a scientific and fundamental law of cure, to be hereafter elaborated and rendered more definite by a series of most interesting experimental researches.

The perfectly normal person has perhaps not yet been studied, for the simple reason that one cannot be found. Perhaps no one has had all areas of the brain equally developed, and perhaps no one has ever learned to use all of the intellectual and moral functions. Perhaps there is no one who has not inherited organic and mental defects or excesses, and there is perhaps not any spot on earth where all of the environmental conditions are favorable to the highest health and mentation. If disease is to be actually cured and if crime is to be abolished, there is but one royal road to such an achievement, and that is by a scientific study of the mind as we find it manifested in living things and as it is capable of being modified by environmental conditions and by its own activities.

November 24, 1897.

THE STRUCTURAL CHANGES OF THE BONE-MARROW AND OTHER BLOOD-MAKING ORGANS IN PERNICIOUS ANÆMIA AND ALLIED DISEASES AS INDICATING THEIR FUNCTIONS AND TREATMENT.

BY M. S. HOSMER, M.D., OF ASHLAND, WIS.

THIS subject is so vast that one can only superficially cover the field in a paper the proper length for a society. Hence, I will only attempt to present to you the principal and latest opinions as I understand them.