The Millennium and Medical Science

By

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TO

THE MEMORY

of the

Timely Friendship and Constant Association

of the late

MAXIMILIAN JOSEPH HERZOG, M.D., LL.D.

to his

Knowledge and Research Work

on the subjects of

Embryology, Bacteriology and Pathology,

his late studies of

Hormones or Enzymes or Ferments

This Volume is Respectfully

DEDICATED

PREFACE

IT is not the intention of the author that this work be considered as a text book or a treatise on the subject of medicine or methods of treatment in disease, but as three individual essays combined, making a concrete story of life; emphasizing life in particular, from a view-point of sociology. The work in its entirety may also be considered as an essay concerning human understanding or liberal education.

In the general outline of this work the writer has kept constantly in mind the necessity of presenting it in terms understandable to the laity, and has adhered to this idea as far as possible. However, in some parts the subjects are entirely new to the eyes and ears of the laity and it is essential that the special nomenclature pertaining to these subjects be used, if we would not lose the importance of its argument and thereby sacrifice its full significance.

The reader will notice that each of the three parts may be considered as a book in itself with more or less connection or bearing on the other two and that the three parts, embodied as a whole, make the concrete impression intentionally implied by the writer. Mention of the chief distinctive features of these three parts will give the reader an idea of what has been contemplated.

First: The entire work is in complete harmony with all contemporaneous writings by the different authors on the many subjects involved and their relative angles.

Second: As near as possible concise statements are made, of knowledge and authoritative opinion on facts, acquired in recent years and at the time of writing, regarding the maintainance of health, and cause and effect of disease, pertaining to the individual and to society.

Third: Stress is laid upon the necessity of teaching youth, at the age of puberty, the truth regarding right living, the true cause and effect of disease and the essential need of knowledge relative to a recognized method of treatment of the different diseases of man.

Fourth: All parts contain, to a marked degree, a volume of truth as we understand truth in its naked form, or a volley of facts which have been encountered and proven true facts, and which we have accepted as facts.

Fifth: While reading this volume the reader may, at times, seem inclined to interpret some parts of the work as an apparently cold and cynical rebuke to the actions of society, or a crude criticism of our present day customs and traditions. This is not the case or intention; on the contrary, this work should be accepted in the broad sense of a sincere endeavor to add, if possible, to the good and welfare of humanity.

The writer has been brief in some instances and on some subjects, merely stating the proven facts which have taken years of time and labor to define and determine, and would require in themselves many volumes, if detailed explanation were attempted in each instance.

While it has been truly said that definitions are tiresome and make monotonous reading, there are instances where they are the only recourse we have, when defining a thing of any consequence or distinguishing one thing from all others or when

clearly outlining what the content of a conception is; therefore, at times, we must necessarily resort to the use of the definition in a work of this type and caliber, that being the only elucidative and comprehensive method of explanation when attempting to define any subject, especially in any work of an instructive or scientific nature. In these instances all definitions have been given in a concise manner, and in words which tend to make them as plain as possible.

The subject, "Endocrinology" or the study of the "Internal Secretions," its importance and significance, has been advocated by several far-seeing men, in years long past, but only in recent years has it gained much ground. The recognition of the few facts now in our possession is acknowledged only by those who have given the subject some little time and study. This is obvious because of its primary and intimate complex obscurity of the present time, and the possibilities of the vast fields of far-reaching entanglements which may be involved, in the study and practice of medicine and surgery, in the near or far future.

One object in mind while writing this volume is to advocate a theory, which may in time become a proven fact, and, therefore, a valuable asset to the practicing physician in the ultimate determination of the true cause of disease, and a guide in the diagnosis and treatment of a given case. This would especially apply to those ailments due to the disturbance of the glands in the human economy which produce the internal secretions, wherein are contained the so-called hormones. However, the advocation of this theory is in no

way restricted to the sense, study and practice of the physician, but should be of vital interest,—only of course, in a general way,—to the average individual, because it entails important facts and some valuable information, as well as theory, of much consequence concerning ourselves, and which every one ought to know.

The "Addendum" should not be considered as an integral part of this book, in the strict sense of being "all bona-fide facts" but to the contrary; a supplement and theory of the writer, based not only upon the many facts involved in this book proper, but also upon many other up-to-date and co-related subjects containing recognized facts, from a material, as well as a scientific view.

The author wishes to express his gratitude to those authors whose books he has read with a bearing on and relative to the subject of "Internal Secretions," also, the publishers who have made this work possible.

D. N. S.

104 So. Michigan Ave.
Chicago, Illinois.
June 1, 1923.

FOREWORD

Whosoever shall find and condescend to read—in this little book—these kindly intended meaty words,

Will find, without a doubt, some things worth knowing, written here, within and between, its few pages,

Perhaps, some valuable information of well-meaning import, concerning himself and herself, also their children;

Which should surely create much wholesome food for timely and daily thought, in each and every mind,

Relative to the future institution of things, for the good and welfare of everyone, and present constitutions.

Our "being" was—conception—our only "beginning," the result of an accidental incident, of a momentary pleasure.

That secret inclination or compulsory force of animation demands we obey the commands of nature's laws;

Love and affinity; with cheek to cheek, heart to heart, desire for desire, the ecstasies of love's climax come;

After many of love's pleasures, there follow the many pains, when a cherub of loving, troublesome comfort appears.

The waste of a little blood at the end
of each Moon,—in the human—tells the
ebb and flow of life's tide;

When a microscopic animalcule, alive with
motion, finds its way to impregnation
of the ovum, or nature's egg,

Then the change in the monthly cycle and
the retention of this vital fluid tissue
mark the "conception" of a bride;

Locked in darkness, so intimate, so close,
and yet so far from all human eyes,
nature's all "wonderous process" moves;

For forty successive lunar phases, here
develops in "marvelous form," without
worldly aid, one more "being" to be born.

To each and every infant, its Father
and Mother owe good blood; that it may
have an equal chance in life.

We may be rich in cash or gold, in lands
or fields and many other things of
worldly loss or gain,

But, to be rich in health; that which
none can buy or sell, is the greatest
richness of them all,

In any stage of life, or in any clime,
regardless of the daily wage, common
earthly worth or temporal power gained.

Of every race and nationality, at any
age, and all humanity, this should
pertain, in part or as whole;

The daily social intercourse and the
physical merits, side of life, as well
as the moral point of view,

Provided, the reader has ordinary
intelligence, is of sound mind, and
sober sense, with truly sane capability,

Should one be called to task, to render
unto himself or herself, an honest
opinion and a fair decision,

In the giving or the passing of a
just judgment, upon each and all, not
as we would desire, but as we deserve.

For by our actions or deeds, of good
and bad, of yesterday, today and to-
morrow, we shall all be judged.

When the hour comes death will claim
its own and we must needs pay the toll,
with life and personality;

There is no prolonging, no barter or
trade and none to ask, none who know,
who can say, or bid us stay;

The air so vast and free we cannot
breathe, our functions fail our vital
needs, we have no choice but must go.

"Our character" needs be brave of heart,
should we attempt success, as we mingle
with the mighty throng;

Yesterday we may have been big and
strong, today we are weak, things are
wrong, tomorrow, we are gone.

So do we depart; into the "Boat of
Charon" or across the "River Jordan,"
we are hied into the unknown,

From whose bourne, no man born of
woman has ever returned and in the
ultimate book, our finis is writ.

But, when into our eternal graves we
go, the secular misdeeds and virtues of
a material doing will refuse to follow.

It is the temporal way of things, our
seemingly small indiscretions now be-
come mountains of bites and stings.

Strange to say, these acts shall live;
the misdeeds as gruesome specters of
shame and humiliation.

Our noble virtues to be remembered and
hailed as monumental memories of
lasting honor and exaltation;

Into the future lives of those loved
ones left behind,—these acts will live—
who will sing and play or pay, and pay.

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INTRODUCTION

Ad vivum

(to the life; to the living)

WE say, "Sociology" is the science which treats of the origin and history of human society and its social phenomena, the progress of civilization, and the many laws controlling humanity, in its numerous phases of every-day life, as found the world over, as viewed from the many aspects of human intercourse in its relation to domestic and political economy.

We of today, also all the different peoples of the world—the so-called civilized and uncivilized, Christian and heathen, regardless of their respective station in life, highly cultivated or grossly ignorant—in one form or another, have our own methods and means of conforming to the laws, written or unwritten, which dominate our so-called "Social System" in accordance with its government (be that system of government good or bad), and the condition under which we live, in the different parts of the world. All study their present and future life (more or less) from several angles, regardless of color or creed.

As the world progresses and the coming generations make their appearance, it is quite evident that there will be more and more knowledge—in every branch of learning—piled up for those to absorb, who are yet to come. In the past century the social, economic and industrial systems and constitutions have changed materially by leaps and bounds of advancement, and the signs of the

times (now more than ever) point the way to a future which will be a continual change of progressiveness. As a consequence we find in our literature of today such terms as, ultramicroscopic, metabolism, susceptibility, prophylactic, idiosyncrasy and many others, all of which are also used quite commonly in the vocabulary of the public in general.

When we view our educational life, generally, it is truly surprising to learn how little some people know about themselves, relative to their physical make-up. By this we mean the physiology of the human system, its normal functions in health, and the cause of perverted function or abnormal conditions produced in any disease process. It is quite evident—from the history of the few former generations—that society in general has paid entirely too much attention to the general appearance of our outer-selves; methods of business, style of dress, politics, club-life, automobiles and worldly pleasures in general, but little or no attention to our inner-selves. It is the things about our inner-selves which we should learn and come to know as being worth while, for these, as well as a knowledge of our outer-selves, are important, and essentially concern us, our families and our future generations.

Biblical legends are of value and may be used as moral lessons. Those historical traditions of interest and worth should be considered, but in a class by themselves. And especially so when the material influences and achievements of the ancient world can be used as axioms and postulates of importance in readjusting and instituting

a regime pertaining to our present day life of reality and progress.

It is only of late years that the essential need of such subjects as "Bacteriology" and "Pathology" have been duly recognized by the educational authorities. These studies and their allied subjects are now being taught—more or less—in all the high schools, therefore the coming generations will be more fortunate than our Fathers and Mothers of yesterday. For this reason the average grown-up of today—who knows, comparatively speaking, very little of these matters—will undoubtedly find, briefly outlined in this work, some interesting facts concerning the methods of all infections and all processes leading to or producing abnormal conditions as found in any localized or systematic disease, with an explanation of their important bearing on the general health.

It will be seen and recognized by the average individual, after reading this book, that it is impossible to draw a hard and fast line between those subjects which are contained in the first part of this work, namely, Biology, Physiology, Bacteriology, Pathology, Metabolism, Immunity and Susceptibility. Each of these plays its own integral part in nature's process under the normal and abnormal conditions. It will also be seen that a knowledge of the subjects in the first, second and third parts of this book is necessary, if we wish to comprehend and appreciate the full significance of the "Addendum."

The only intelligent view of our cell life (in the human) must necessarily come in the form of "cell life under the microscope" if we would know

and understand it. Any individual is dumb to the extreme who does not know—after attaining the age of twenty-five, if not before—that, every human has a liver and the function of the liver is to produce bile; that every human has (or should have) two kidneys and their function is to produce urine; that every female has two ovaries (or should have) and their function is to produce the ovum or egg; that every male has two testes (or should have) and their function is to produce the spermatozoon or spermatozoa; it is the generative element of the male (the spermatozoa) which serves to impregnate or fertilize the generative element of the female (the ovum) and thereby produces life; all the above mentioned organs and functions are considered common place knowledge of today. The human body is truly composed of many structures or organs and these are surely made up of specific cells, each cell performing its own function.

When we speak of the cell life and its composition—in the make-up of the human body and the part it plays in "health and disease" in the life of every individual—using such terms as nucleus and nucleins, protoplasm and proteins, it must be understood that it is a difficult matter to draw a strict or definite line, separating those intimate constituents which make up the individual cell or the unit or component parts of the organs of the human.

We may say, however,—it being important of observation as we proceed—that the "nucleus" in a general way is considered as the "germinal center" or the germ of all cell life, it being—as a

rule—a spheroid body within the cell forming the essential and vital part, and is distinguished from the rest of the cell by its denser structure. It is made up of a network of threads (chromatin) contained in a clear liquid (achromatin) and by containing the "nuclein," which forms the essential chemic constituents, of the nuclei of cells, it being a colorless amorphous compound (of no definite shape) consisting of nucleic acids and bases which vary with the different varieties of nuclein, filling the spaces between the network of threads.

The "protoplasm"—as a rule—surrounds the "nucleus" or nuclear body; protects and supports the life of the "nucleus," being a viscid, granular material which forms the essential constituents of the living cell. It is composed mainly of "proteins," and under the microscope is seen to consist of a network (spongioplasm) containing a fluid matter (hyalplasm) in the meshes; the whole—"nucleus" and "protoplasm"—being closed within a delicate film-like structure, the cell membrane. In every instance of all life, these cells are held in place or together by a network or framework known as the "stroma," which make up the organ.

It is quite possible that for many thousand years before man came, there existed upon our earth only a crude form of cell life. Therefore, it would not be fair to our early or late ancestors (have it as you please), whomso-ever or whatso-ever they may have been, not to mention at this point something about those progenitors, as we know them, namely, cell life. We, no doubt, are the result of an early "cell life" which has priority of right,

by virtue of first arrival, therefore previous discovery and possession;—long before the domination by man arrived, long before man inaugurated education;—long before the science of sociology had its original conception, by the education of man. We now know,—should we take the time and trouble to learn—that from the very beginning of all life and at the present day, everything that has life is made up of cell-life and all cell life, great or small, independent or organized, lives its life and dies; even as you and I.

PART ONE

OBJECT LESSONS
IN
HEALTH AND DISEASE

HEREIN will be discussed several subjects of interest, laying particular stress upon their relations to the human body with its various and intricate compositions of live mechanisms, which provide the controlling forces for the disposition of all liquid and solid foods, its conduction into mental and physical energy and its elimination of all waste products; the combinations of defensive forces and detoxicating functions with its never ending opposition and battle against food toxins, chemical toxins, bacterial toxins, irritations and injuries of a minor or major character.

These individual affinities, idiosyncrasies, immunities and susceptibilities and its hidden process of body mineralization, assimilation and growth, as viewed from the physiological, biochemical, physiochemical, bacteriological, pathological and its constructive and destructive metabolism, standpoints.

The significance of all forms of bacteria and the part played by them in all infections—in any localized or general condition—in the human body, and the possibilities of these microörganisms

bringing about a pathological condition, resulting in a temporary or permanent disease. Consideration of mode and methods of transmission of the so-called social diseases now prevalent, to a great extent, in society.

It is necessary that we recognize first of all the great importance of the individual cells,—each with its own particular construction, adapted to its individual function—which make up the different organs in the human. We cannot afford to pass the question of cell life, without some mention and comment relative to the important cells which are found in the blood stream. To disregard the cell life of the blood stream and its general properties would be an error. The study of the blood is known as hematology, and a little knowledge of this study is very essential to all subjects in this work. The blood stream as a whole consists of liquids and solids and is sometimes termed the "vital fluid tissue."

The blood stream is to the human body what water is to vegetation; the blood stream supplies the necessary nutrient properties, to all other cell life (contained in all the organs of the human, so they can perform their several functions); it carries the energy-yielding and body-building food from the digestive organs to all other regions for immediate use, or for storage (as fat or starch molecules) against the time of want, during mental and physical exertion, and all the work we do is an expression of the energy derived from these stored up molecules, previously contained in the food we eat; all being brought about by way of the blood stream; it carries from the lungs to the

needy structures, far from the source of supply, the oxygen required for internal combustion; it distributes heat in the body from warm to cold areas; it conveys waste materials (carbon dioxide, water and salts) from where they are produced by the wear and tear of bodily activity, to and from the lungs, kidneys and the intestinal tract, as well as other organs, in its process of elimination; it is the means of influencing (through the internal secretions) all manner of structures and functions in the human body.

We will discuss for the moment, only the two cells of the blood which are apparently most important; first, the red blood cell known as the erythrocyte, is a biconcaved disc in shape, composed of a soft elastic substance. In thin layers these cells are green, and in thick layers red in color; they are composed of a stroma, or kind of framework, largely of lipoid material, in the meshes of which is deposited the substance known as hemoglobin. In this way the red-blood cell performs its most important function necessary to life, the oxygen-carrying power of the blood. There are about five million of these red-blood cells to every cubic millimeter of normal blood in man. The red-blood cell in its normal structure and under normal conditions has no nucleus.

The white-blood cell known as the leukocyte is also a native of the blood-stream but differs greatly from its brother, the red-blood cell, in size, consistency and function; there are several kinds of these white-blood cells in normal blood under normal conditions. These white-blood cells are mostly important from a function standpoint, it being

their duty to assemble in vast numbers at the spot or site of any injury, infection, or process of inflammation, to combat any disorder of an abnormal tendency by attacking any foreign body, organism or necrotic (dead or decaying) tissue, by an unknown process of ingesting and digesting them; these white-blood cells are sometimes termed the protective cells, or the policemen of the human system. This cell differs from the red-blood cell, having in its normal construction and under normal conditions, a nucleus, of various shapes and sizes. The origin of the cells of the blood is said to be the red marrow of the bone and the lymph glands but there is some contention as to the specific origin of specific cells found in the blood, so that the question remains (more or less) an open one, with much to be learned. It is said that during all periods of life there must be a more or less continual formation of all cells of the blood with an ever constant deterioration or wasting of these cells, the process of production and destruction being greatly accelerated by different stimulations and under different conditions, with nutrition and abnormal conditions playing their parts. It has been said: "We are at the present time in the beginning of the experimental phase of hematology," or the study of the blood.

CHAPTER I

BIOLOGICAL PHYSIOLOGY

"Life is not for learning,
nor is life for working,
but learning and working
are for life."
—*Herbert Spencer.*

IN the early stage of man's development, long before the so-called "stone age period" it is possible that this animal-man devoted the greater part of his life to self-protection; waging a continuous battle with the elements, as well as fighting not only the other wild animals of different species but also the antagonistic nomadic tribesmen; hunting and fishing for food and seeking shelter for himself, his mate and offspring. Through the ages this trait in man has been paramount to all other considerations, thereby creating the hereditary tendency which has rightfully inspired or prompted the expression, "Self preservation is the first law of nature."

During the many periods or ages of transformation,—from subservience of his early environment, to the master-mind of our present day life, long after the indefinite stages of early metamorphosis of the really lower animal had passed,—the daily routine of the animal-man compelled him to be out in the open air the greater part of his time, therefore he was strong and healthy in body, ambitious in the way of reproduction of his

kind, and brave in spirit as well as moral courage, but his mental capacity was undeveloped, his only school being his powers of observation.

This animal-man now changes to the man-animal. It is true that he had changed in the contour of his body many years ago, but the animal traits and instincts remained. Every day he arose with the sun, for the sun was his only clock and he went forth to secure, as best he could, enough food and drink to sustain the life of himself and his family but for that day only. After darkness had come and gone and the sun again shone, he would go forth again to find things to eat and drink, just like other animals. To this animal-man there was no tomorrow and no thought of the morrow.

Then came the instigation of valuation and there soon followed the greed for gold. The mentality was beginning to assert itself, the wild animal nature was losing its prominence. No longer did this semi-civilized man sleep in the underbrush or in caves, nor eat his meat raw. Man had learned to kindle fire at his will and therewith boil water, live in a house and clothe his body; finally he developed an inclination to acquire knowledge. Is it any wonder that the small boy of today does not want to attend school or learn anything, not to mention the many grown-ups who have a marked aversion to learning. Could there be any doubt as to this hereditary trait, "being in the blood"?

The alchemist of the "Middle Ages" who sought to produce gold from a chemical compound was indeed a typical example of how the animal-man had passed into the man-animal, then advanced

from the brutish nature and untutored mind to the literate and industrious. However, it also demonstrated other lessons learned by man; the development of the avaricious nature, to have, to hold and to hoard. No longer was this man-animal, like his ancestors, the lower-animal species, there being much evidence of change, even to his close relations, the plantigrade carnivorous mammals, who still remained in the wild animal kingdom; roaming on the mountain-side among the elders in search of food, crawling into a cave, a hole in the ground or into a hollow log, when night came, to rest and sleep, and for protection from the elements.

So we find the man of ancient history, with the strong, healthy body, containing an almost fearless animal courage and the hereditary spirit of adventure, incensed by ambitions of discovery, conquest and future power, devising and contriving the ways and means to visit the distant and strange lands and seas. In systematic methods he begins to delve into the secrets and laws of nature's processes relative to "his own existence" and those of his environment, "Mother Earth."

When we keep in mind the fact that, "we do not live to eat, but we eat to live," this should bring home to us also the fact that, every individual is composed of the earth's products; in other words, we are to a marked degree, the result or sum and substance of the fruits and salts of the earth, with its many chemical properties and environment, namely, gases, liquids and solids, principally composed of the many primary elements such as, oxygen, hydrogen, sodium, calcium,

and many other minerals, singly or in combination, all being more or less of a chemical and inorganic nature.

We will not consider, for the moment, those compounds and better known products of nature's work, such as carbohydrates, proteins and fats. The carbohydrates are known as the different forms of sugars and starches; the proteins in the form of albumins, glutens and legumins; the fats are butter, lard, tallow and fatty oils. These are found in many combinations, constituting man's food in its various forms, being produced by the several "ways and means" of nature's process, and are known to be composed of the many primary elements. Perhaps we should entitle this chapter "Bionomy," or "Physiochemic Biology," since we are dealing, more or less for the moment, with the science which treats of the study of the laws of living functions.

Under the term "Biochemistry" we study and learn to know those things relative to life which are of a chemical composition, being composed, as they are, of inorganic matter; these primary elements being contained in combinations of air, liquids and solids are received into the human body in the form of foods, but not until these foods have been prepared for the human by first having passed (in most instances) through a secondary stage of a constructive and destructive nature and a tertiary stage or process of a reconstructive and redemptive character, all of which is known as "metabolism," in the laws of nature. These several foods of nature's making are necessary material, in proper amounts and kinds, to sustain life,

from several vital viewpoints. First, in every individual who would enjoy "good health." Second, in every "prospective" father and mother. Third, in the "formation" and "construction" of another "being" in the giving of a new life; in every expectant mother from the moment of conception up to the hour when the child is born into the outer world. Fourth, in the nursing mother.

Having arranged these several vital viewpoints into four stages, it may be seen that these stages really comprise the life cycle of man, in this particular phase of cause and effect of human existence, as follows: beginning with the new-born, we have the first stage in the nursing mother who will by eating the proper foods, in amounts and kinds, give to her infant the proper food in amounts and kind, by way of mother's milk;—when the child is old enough, it should be fed the proper foods in amounts and kind, later being taught in its youth the necessity of continuing to obey this unwritten law throughout the natural life—taking for granted that the first stage has been duly complied with, the second stage consists in the continuation of eating the proper foods in middle life, so that the male element of the prospective father and the female element of the prospective mother will contain, at the moment of conception, the proper constituents to produce a normal and healthy child; in the third stage we have the expectant mother who should eat the proper foods in amounts and kind, so that her offspring may benefit thereby in its early development and thereafter until it is born; having arrived at the fourth stage we have completed the

cycle and are back to the nursing mother, suckling her new-born, the infant being considered as the fourth stage; in other words we may say, the pregnant mother is stage one, the nursing mother is stage two, the child after the suckling age is stage three, and adult life after the age of puberty is stage four. All of the above has to do with the chemism, or the chemical affinity, in Nature's processes, of her various methods of composite compounding or her ultimate amalgamation of these substances (the foods) into different compositions, containing certain combinations of life's properties, which evidently are the all-essential requirements for our existence.

Biology may be defined as the science of life or living organisms, and Physiology is defined as, the branch of biology that treats of the vital phenomena as manifested by animals or plants. This manifestation may be summed up in one word, "function," there being incorporated within this term, "function," the unknown processes of growth, movement, mentality and reproduction, constituting in this instance, animal physiology. As a result of these general activities or this "function" in general—not only the functioning alone of the human being as a whole, but the functioning of the many individual structures of which the animal body is composed, as well as their combined functions—the animal at some definite period in life reproduces itself, in consequence of which the species to which it belongs is perpetuated.

Life in every instance, when viewed in terms of stern reality, is only an indefinite period or

extension of animated existence and always of a relatively known temporary character. Man in his finite capacity is of minute existence, and, generally speaking, of little significance in his passing; even today he is at all times at the mercy of the elements and in his environment entirely dependent upon nature's laws, and truthfully admits he has no knowledge, voice or choice in his forthcoming, the wherefore nor where-from, as well as the wherefore nor where-to, in his going.

The life of the average man of today is said to be about sixty-five years, then we say "he dies." When death occurs it is recognized by the evidence of the several specific characteristics dependent upon the different changes produced in the many species which at one time constituted life, organic or inorganic, embracing all mineral, vegetable and animal life, as known to man upon earth. All things that live and die, is that manifestation of the absolute certainty based upon an unconditional termination, long before the conception has taken place which gives the origin to that life and which is to be taken away by death. When we say mineral life or inorganic life, it is intended that this be construed as those inanimate properties produced by nature's processes; these being the primary essential contribution, and no doubt the fundamental principle to all secondary life or organic life in the various animated forms.

It has been recognized by many authorities and advocated by others that nothing can exist comprehensible to the senses except there be a positive and negative phase—leading up to or with a purpose of ultimate construction—to make a con-

crete whole, especially as to actual existence and performance of function, regardless of size or combination of structure. Therefore, if we accept for granted that "life" is "positive"; it is then obvious that its opposite, "death," must be the "negative." These two important facts—the positive and negative phases of all life—no doubt play their part in life, primarily as individual factors, each contributing to the whole, and secondarily, performing their function after becoming united; this apparent continued action and reaction make up to a great extent our creation of what is known to man as human existence on "Mother Earth." In other words and from a broad sense of view, whenever and wherever we learn of any one thing, there will always be found upon investigation, its direct opposite which must necessarily be either of the antagonistic or repelling nature in some instances, or must contain the powers of volitional accord and harmony in other instances, but in either case, depending upon those unknown forces of individual characteristics and unknown laws of specific "attraction" (affinity) and of an alluring nature in some instances, or the attributes causing "repulsion" (inimical) and of perverse tendencies in other instances, when it so happens that these primary factors are brought into contact with each other; this is known as the "positive" or "negative" chemotaxis. For example we may mention great and small, hard and soft, elastic and brittle, black and white; in another class we find wet and dry, hot and cold, rich and poor, male and female; these things and many more produce a neutral state or a secondary thing or substance when the

extremes or primary elements are brought together.

In the study of the life of the human, it has long been recognized that "harmonious co-operation" of all "organs and functions" are essential to the "life and well being" of the individual; though widely separated from each other and performing totally distinct functions, several organs are at all times closely allied to each other, and co-operating for the purpose of some secondary function in which their individual functions are not only blended but necessary to the life and further function of the animal body as a whole. Therefore, we may define "Biological Physiology" as the science which treats of the study of the relative life properties, principles and constituents which aid, or cause to function, those organs contained within the human body, thereby maintaining and reproducing life.

After due consideration and deliberation of the above, it is not at all strange that the average child of today objects strenuously when compelled to attend school and master our methods of learning. In the child is found the hereditary traits of our early ancestors who were carefree and ran about like the lower animals, in ignorance and nudity, and the small boy of today would easily follow in the footsteps of his savage progenitors if so permitted. The proximity of this relationship can be readily seen when we quote Doctor Johnson, who said,

> "Pity is not natural to man.
> Children are always cruel.
> Savages are always cruel."

The full significance of these words, which we must acknowledge as truth and therefore fact, may be represented in the following terms: the blood of man is to be regarded as "alive" in a strict sense, having powers of sustenation, defense and reproduction of life, subsisting mainly in the fact that "new organisms" (the human and his many parts) arise from portions of living matter, separated from the parents, because these "new organs" consist of portions of the parental protoplasm; they having their origin, arising and being formed from pieces of this same protoplasm, growing under similar conditions. In the simplest cases there seems to be no question as to the "laws" and "forces" of heredity; man's blood being the dominating factor in his heirdom. It may be stated further with all sincerity that many individuals of today, of all ages, never learn to divorce these hereditary traits of indiscretion and aversion to learning, therefore they are passed on to their children, not alone from the heredity standpoint but also inculcated, unknowingly perhaps, morally. As a consequence, these and many more of our hereditary tendencies never die.

CHAPTER II

BACTERIOLOGY

THERE are indeed many important factors responsible for the discovery of the numerous groups of microörganisms or bacteria, and their different types, forms and actions. Nothing, of course, but a mere hypothesis (relative to their actual existence) could be formed until these animalculæ were seen by man. It is said a father and son by the name of Janssen, who lived in Holland in the year 1590, constructed the first combination of lenses in the form of a microscope, thereby adding to the fundamentals of this discovery. In later years there was perfected a fairly good instrument, and with its aid could be seen these animalcule bodies moving about in the different fluids and organic substances. It has been found in early writings—some say in the century before Christ—that there may exist in our world, animals of so minute a nature, that they can not be seen by the naked eye, and when they entered the human body in the form of air or water and with our food, they produced disease therein.

In the years that followed many men were termed "seers," "wizards" or "sorcerers" because they dared to have such ideas as the existence of bacteria and endeavored to prove their theory. They were mocked and scoffed at, treated with scorn, some thrown into jails for life and some put to death. Eventually, recognition of the theory

came and then with the demonstration by the aid of the microscope, bacterial life became a material fact and the first step was taken towards the discovery of the cause and effect of much disease in the human body.

So it may be seen that this conception that diseases in the human and the lower animals are due to bacteria, originating in the body or entering the body from the outside world, and multiplying therein is by no means a modern idea, but has been advocated for centuries. The question was debated and almost forgotten until it was discovered that certain fermentative processes were brought about by these microörganisms and their action. Then followed a long and continuous controversy—strong and bitter argument from all sides, involving theory, experience and experiments—as to whether or not these microörganisms were a demonstration of the "spontaneous generation of life," occurring in the different organic material, thereby producing a fermenting or putrefying process.

In the final demonstration of proven facts, that all "bacterial life" were not of a spontaneous nature, but are actually material things which are transferred or transmitted from place to place or from one thing to another or from one individual to another, there was also born the conception of antiseptic precautions and aseptic conditions. It was quite natural that man when once convinced of the presence of the microörganisms and their detrimental characteristics, should use all possible ways and means to combat this formidable foe of all mankind. These animalculæ in their mis-

chief-making processes have in the past, given and are at the present day, giving to man—in all his glory of achievement—the battle of his life. It is not a fight for a day, a week, a month or a year, but one continued conflict, which has caused untold deaths of mankind, from time unknown, and which will continue, no doubt, for ages to come.

The fact that there really is much philosophy in everyday life cannot reasonably be denied, but we of the majority, the so-called common people, are so busy in the continual daily grind of securing the necessary commodities of life, and by more or less compulsion attending our daily tasks, in many instances thereby eking out a bare existence, have but little time left for the purpose of analyzing life. The strain of the wear and tear on the mental capacity and physical structure of adult life is to be considered as foremost in importance. In this respect man's struggle for existence and his many endeavors to maintain a healthy mind and body, when at all times he is more or less subjected to the various attacks or invasions of the numerous forms of deleterious microörganisms, is without question his greatest problem in every-day life. The large percentage of individuals who are today suffering from infections, such as syphilis, gonorrhea, tuberculosis and the many other infectious diseases, attest this claim.

The many trials and tribulations of human life, surrounding man at every turn, doubtless play their part in effect, and as a consequence there must needs be a reaction. There are but few of us who have a mind broad enough in its allowance of mitigation and moderation in its general

deduction of mankind; few who possess a so-called soul, kindly in its generosity of submission when dealing with those unfortunate individuals (in our every-day life) who are poor in cash or estate, or sadly deficient in their mental or physical capabilities; rarely do we find the man who (engrossed with the problems of every-day life) will stop to consider the ultimate truth in the termination of man's life, to-wit: that the wealth, power and physical strength of man is, as a whole, a finite existence, and any worldly comparisons of these earthly acquisitions by man among his fellow men, are not only true exhibitions of the base passions but an actual demonstration of the egotism and forgetfulness that possession and duration of power, wealth and ostentation are indeed transitory. As a major class we clamor and strive for gold and power which, when attained, are generally used to subdue our brother in the effort to gain more power or hoard more gold. One great writer said, "Man's inhumanity to man makes countless numbers mourn." And again, in the Greek literature we find written:

> There was a war begun to punish an iniquity. Year after year it drags on;—
>
> Till a murmur is begun, and there steals an angry pain
> Against kings too forward in the strife.
> For of God not unmarked in the shedder of much blood,
> And who conquers beyond right.
> Man by suffering shall learn,
> So the heart of him, again
> Aching with remembered pain,

Bleeds and sleepeth not, until
Wisdom comes against his will.

But, O, the way is long, and the weary world, like the old man of the Argive state, hears a rain that falleth bloodily, and it gropes and murmurs:

I am lost; my mind dull-eyed
Knoweth not nor feels
Whither to fly nor hide
While the House reels.
The noise of rain that falls
On the roof affrighteth me,
Washing away the walls;
Rain that falls bloodily.
Doth ever the sound abate?
Lo, the next Hour of Fate
Whetting her vengeance due
On new whetstones, for new
Workings of Hate.

When punishment, through ignorance or hate, becomes the be-all and the end-all of all existence, then the day comes when the punisher is punished. So it was, always, and ever will be, everywhere."

Into this apparently malevolent, milling and surging maelstrom of humanity, with their pulling and pushing as they tug and maul each other, every now and then there is thrown a man, whose views of life are quite different from those individuals who are all about him. In his own way this different man is beseeching his brother, "not to look upon much wine, when it is red, but a little is good for your stomach's sake," and quietly reminds him that, "all is not gold that glitters," and that "the days of man's life upon earth are num-

bered." Some listen and profit thereby; others scoff and laugh, and turn their backs upon him, and continue to struggle in life's rut and the channels of excitement, with its brawls and wrangles of uproar, eventually becoming an invalid or a cripple from disease, or are drowned by death, in the tumult of humanity.

"He who the sword of heaven will bear,
Should be as holy as severe;
Pattern in himself, to know,
Grace to stand, and virtue go;
More or less to others praying,
Than by self-offences weighing,
Shame to him, whose cruel striking,
Kills for faults of his own liking."

—*Shakespeare.*

Of all the great benefactors of the human race, the Frenchman, Louis Pasteur, stands with a few others in the front rank. It is just about fifty years ago today, that the truth about microörganisms and insects, as the cause and the carriers of disease began to dawn upon the world. About that time, Pasteur said, "Oh, why am I not rich,—a millionaire? I would say to you: Come! We shall transform the world by our discoveries." Today we find the words of his wish have come true. Practically speaking, the world has been transformed in the past fifty years, by the great discoveries, and by the study of bacteriology.

There is much shedding of life's blood and there are many demonstrations of death, other than the actual carnage among men with sword, bayonet and gun, in open conflict upon the battlefield. The microörganisms of disease kill thou-

sands of people every year, in every land. There is stalking about, with a great bludgeon, in the midst of all the peoples of the world, a great giant, "Argus like," with many eyes of pernicious intent, ever watchful for victims, maligning the health of human beings by the thousands. This vile monster, "Cerberus like" has many heads, three ugly heads in particular, each with its yawning maw which is never satisfied; these are syphilis, gonorrhea and tuberculosis. This hideous and distorted thing is known as "disease." With its many cravings of heinous appetite, it lives defiantly among society, sucking the blood and sapping the vitality of every individual with whom it comes in contact and who is unfortunate enough to fall a victim to its snares.

The question has often been asked: Why is this polycrano-monster of disease among us and where did it come from? The question may be answered from this point of view: Bacteria or microörganisms, being of a material nature, like human beings, evidently originated with the origin of man. It is, however, quite possible, that some forms arrived upon our earth many thousands of years before the advent of mankind or his ancestors. Those microörganisms which cause syphilis, gonorrhea and tuberculosis, are of social inheritance, an heirloom handed down to us by our ancestors, not intentionally, but because our forefathers were ignorant of the subject of bacteriology, for many hundred years. Today, we are just beginning to realize its real significance, and that these three diseases, so much in evidence, are only the result of a pestilence which has for

ages traveled on and on, with practically no obstacle, in the form of treatment, to check its progress; therefore, its dimension of contagion grew larger and larger, generation after generation, thereby reaching its present day magnitude, in its destruction of health of the human family.

Human beings are naturally material things and have a material existence; without air to breathe, water to drink, and food to eat, the individual will pass beyond the great divide which separates the earth we know, from all things else we know not of, the wherefore, when or what. This much we do know: wherever human beings are, there is always some form of bacteria, and when there is discovered a so-called new land or a new people, there is always found some new form of bacteria. Therefore, it is said that, bacteria are ubiquitous or omnipresent, meaning, that these minute animalculæ are found everywhere on the face of the earth and in indefinite numbers, all over the world; or they have the power of existing always and everywhere, apparently, without beginning or end. The primary origin of the different forms of bacteria at present is confined in obscurity. This question may be compared with another question which is often asked. For instance, if the first egg came from a chicken, where did the first chicken come from? And if the first chicken came from an egg, where did the first egg come from? We will not attempt to answer any of these questions here. No one will deny that the chickens are material things and the chickens' eggs are material things and both are here, seemingly, for the material human beings

to eat of both, when they wish. We are convinced that bacteria do exist. We find them in the air, in the water, in the soil, on the surface of the bodies of animals and plant life, inside of live animals and in all decaying substances, especially of an organic nature. Bacteria are material, just as material as human beings, the difference being that bacteria are only seen individually, when put under the lenses of the microscope, but these microörganisms are plainly visible "en masse" to the naked eye in any infected suppurative wound, meaning, a wound which is producing and discharging pus, and in this pus are found many millions of bacteria.

A long period of time and vast amount of work are required to prove and perfect, even to a comparatively practical degree, any study of consequence, from the birth of the theory as a thought, until this theory is advanced, step by step, to a stage where it becomes beneficial as a practice and attains recognition of merit as such. As an illustration we will trace in a concise outline, the subject known in the study of medicine, as bacteriology. From what has been written above, together with what is to follow, it may be gathered as a fact, that this subject has held the attention of man, since the beginning of the Christian era; after all this time and study, we cannot say, even today, that we are thoroughly acquainted with its numerous details.

Bacteriology is the science which treats of the study of "Bacteria" or "Microörganisms" which are unicellular and asexual in nature, (being composed of a single cell and without sex character-

istics). They live without the aid of chlorophyll, multiply with exceeding rapidity and reproduce themselves by transverse division or sporulation. —(Chlorophyll is defined as that green substance taken up by plant life or the green coloring matter produced in plants, by the aid of Sunlight.)—It is the quick reproduction or the fast multiplication of these microörganisms, (one of their chief characteristics) which causes much trouble. In their method of propagation they sub-divide or split into two parts, each part becoming a new microörganism every few hours, and wherever there was one microörganism a few hours before, there are two now. This happens where there are hundreds of millions of these microörganisms and occurs in all instances, except where a particular type of microörganism has the special faculty of producing a spore. In this instance of spore-producing microörganisms when anything attempts to destroy it, this microörganism has this unknown power of producing this spore or in other words, a part of the microörganism has the faculty of developing into or reverting to the form of its ancestors, a spore; this spore life is, generally speaking, on the order of an egg, round or oval in shape, enclosed in a gelatinous capsule, with an outside wall of a waxy consistency, the whole being composed of properties which have remarkable resisting qualifications and wonderful preservative ability. This procedure of spore-formation is only resorted to in the bacterial life, when the life or existence of the microörganism is in danger of annihilation,—it, like human beings, follows the code, "self-preservation is the first law of nature,"

and will endeavor against strong odds to reproduce its kind—this is, therefore, a method of protection of its kind, against any and all things or agents, which may be detrimental to its present life or future existence. Only when extreme measures, such as, actual burning and pure acids are used, in an attempt of an extermination process, can this spore be destroyed. Should the destroying agent be not strong enough, then the spore lies dormant and unharmed for a time, until all danger is over and from this spore will spring a new and live microörganism and it will immediately begin to reproduce by splitting and making two and they in turn split again, making four, and so on, just as other microörganisms proceed in their regular method of reproduction, but if anything interferes with its continuation of reproduction, the spore-formation preservation power is immediately called into action.

An explanation of this somewhat confusing and technical dissertation is now in order and will therefore be taken up seriatim; the term microörganism is taken from the Greek, mikron or micron, meaning small, which is one-millionth part of a meter; an organism is any individual animal or plant, or any part of the human body, with a special function; unicellular means, made up of a single cell;—it must be remembered here that, as a rule, in biology or the study of life, all organs or organisms individually or collectively are made up of many hundreds of thousands of cells;—the term, asexual, is understood to mean, having no sex or without sexual characteristics of male and female reproductive elements. Chlorophyll is the

green coloring matter taken up by plant life, but only in the presence and with the aid of sunlight. So, when we say, "bacteria live without the aid of chlorophyll" we mean, bacterial life is contrary to plant life. Sunlight is necessary to plant life but detrimental to the life and growth of bacteria. Plant life in almost every instance has sex characteristics, bacteria has none. Oxygen is necessary to animal life and after being taken into the lungs is again given off in the form of carbon dioxide during the action of respiration; this carbon dioxide is necessary to all plant life but not necessary to bacterial life. It would be well to mention here that some microörganisms are known as aerobic bacteria, meaning they need air or its principal ingredient, oxygen for existence, and other types of microörganisms are known as anaerobic bacteria, meaning they will only live, grow and multiply under conditions where all air is excluded or without the presence of oxygen. These are some of the many points of significance which are contrary to the contention of some authorities who maintain that bacteria should be classed with the vegetable kingdom. This is all the more comprehensible when we are reminded of a few things such as, potatoes, beets, turnips, celery and corn, all of which are green, except that part of the plant which is shielded and therefore protected, in one form or another, from the action of the sun and not exposed to the sunlight.

When speaking of these animalculæ (whether it be an individual type or some special form or all forms and types combined as a class or as a whole, it matters not), of the many synonymous

terms used or different names by which they are known, the term "microörganisms" has always appealed to the author as being the most logical and proper one to use, because none of these animalculæ are macroscopic (they cannot be seen with the naked eye) but are in every instance microscopic and can only be seen and studied with the aid of the microscope.

These animalculæ of microscopic size in the bacterial kingdom are known by synonymous terms as follows:

Schizomycetes, ...used mostly in scientific work.
Microörganisms, ..used in the study of medicine.
Bacteria, ...used for comparing specific forms.
Microbes, ...used generally by the laity.
Germs, ...also used generally by the laity.

There are five different and distinct shapes or forms of these animalculæ as follows:

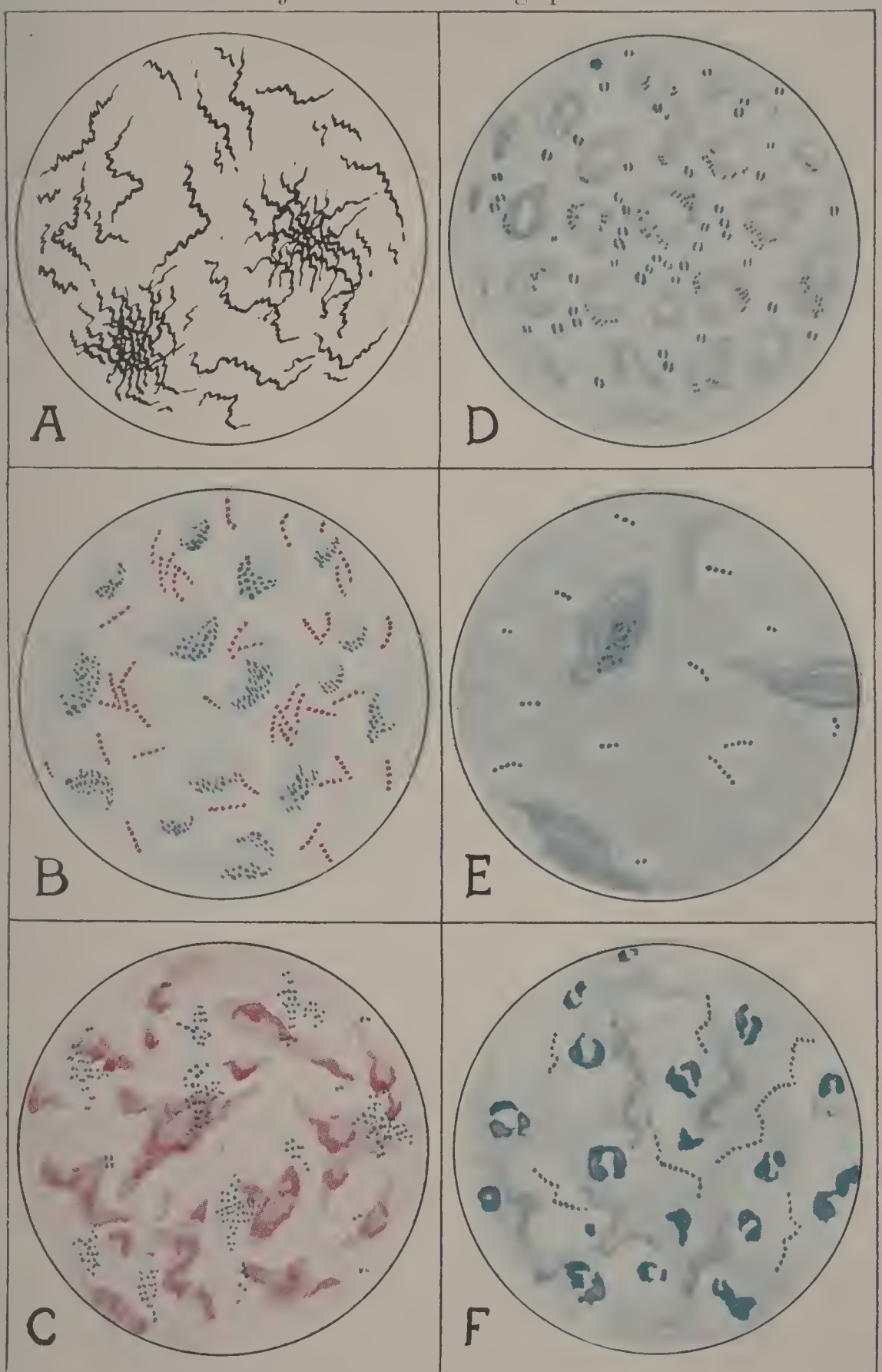
Bacilli, ...the straight oblong, like a twig.
Cocci, ...the round or spheroidal, like a ball.
Vibrio, ...the crooked oblong, with one turn.
Spirillum, ...with two or more turns or crooks.
Spirochæta, ...with many crooks and turns.

The names of several of the many microörganisms and the disease produced by them now follow:

Microörganisms	Disease Produced
Bacillus Tuberculosis	Tuberculosis (all forms)
Spirochæta Treponema	Syphilis (its many phases)
	Locomotor Ataxia
	Paresis
	Insanity
Gonococcus	Gonorrhea (in adults)
	Gonorrhea ophthalmia (in adults and in the newborn)
Streptococcus	Septicemia (blood poison)
Staphylococcus	Many pus conditions
Bacillus Typhosis	Typhoid Fever
Pneumococcus	Pneumonia
Bacillus Diphtheria	Diphtheria
Bacillus Tetani	Tetanus (lock-jaw)

Much of the minor details, relative to this subject, has been necessarily omitted. Let it suffice to say, that many questions considered as perplexing problems by our forefathers, relative to the nature of all disease, have only of late years been answered, but only in a comparatively concrete form, involving untold energy, long effort and much sacrifice of scientific research work, extending over a period of about two thousand years. This may be better understood when we consult

FIG. 1. MICROORGANISMS WHICH PRODUCE DISEASE.
As viewed under the microscope, and being subject to a staining process.



A. Spirochaeta treponema (pallidum).
The causation of syphilis.

B. Bacillus Tuberculosis (in red).
The causation of tuberculosis.

C. Staphylococcus (in blue).
The causation of pus conditions.

D. Gonococcus (a diplococcus).
The causation of gonorrhea.

E. Pneumococcus (encapsuled).
The causation of pneumonia.

F. Streptococcus septicus (in chains).
The causation of blood poison.

our chronology and learn that the beginning of physical science in its earliest stages of development began to exert itself in the land of Asia whence the Greeks took their earliest ideas of science in the year 580 B. C. To these Ionian philosophers we must turn, for the first knowledge of an advance on the mythological view of nature, and the departure from the mystical symbolism which then held sway.

The significance of the part played by all branches of science, in our present subject, may be readily seen in the evidence evolved by the study and ingenuity of man, in the following statements:

The perfection of methods to manufacture the different metals.

The processes developed to produce glass and lens grinding.

From both of the above essentials come the perfection of the microscope.

Then came the more intimate study of all plant and animal life.

About this time close investigation of all inorganic matter began.

Comparison of functions in vegetation, lower animals, and man, also similarity of structures was now begun and studied.

Soon followed the discovery of microörganisms, and their possible relation to plant and animal life was investigated, especially their action, beneficial or detrimental to man.

The scrutinizing of all bacterial and chemical phenomenal action is still in the present epoch of history making.

CHAPTER III

PATHOLOGY

IN defining this subject, pathology, one author says: "In the cell, the organ, or the individual, any deviation from the normal is a pathological condition." The bone of contention here is: where does the "normal" leave off and the "abnormal" begin? Viewed from another angle, we may say: there are instances, where a condition—without evident factors, of a truly pathological or disease process—may be considered, by some, as "abnormal" in one individual; this same so-called "abnormal" condition may be considered as "normal" in another individual; for instance, the "normal pulse" is said to be seventy-two beats to the minute, but there are many hundreds of people whose "pulse" beat is anywhere between seventy-four and eighty beats to the minute, and they are perfectly healthy in every respect; therefore, we cannot call these individuals "abnormal" to the extent of a "disease process" or a "pathological condition" extant.

It is rather a difficult matter to confine ourselves to a precise definition of pathology—the science which treats of disease—because of its many angles of contention and its many phases of manifestation, all of which are of a complicated character and may lead us into a maze of mental confusion. This we wish to avoid. This subject to be justly understood in its most minute

details, requires a knowledge of normal and abnormal histology, bacteriology, physiology, and anatomy; a knowledge of the chemistry of life and the significance of cell life in pathology, and the inter-relationship of cells, organs and other structures; the excitants of disease, the characteristics of disease, and the classifications of pathology, together with its correlated sciences, which are many.

In the study of pathology we should consider general pathology and special pathology, as being most important. The maintenance of the normal conditions in the human body during a lifetime, involves the sustaining of a continued normal mechanism, therefore, under this subject we must also consider those things upon which good health depends, namely, the disposition to disease in the different individuals, depending upon age, sex, race, heredity; disturbance of nutrition depending upon excessive or insufficient amount of food or drink and of the proper kinds; environment of the individual, such as, good air and water supply, sanitary conditions, excessive heat or cold, during the hours of occupation as well as in our moments of leisure and rest, together with a consideration of the proper amount of rest.

Many authorities have likened a healthy man to an efficient machine, and its capacity for the transforming of energy has been expressed in physical terms. This comparison in many respects is misleading; every individual has—at least to a degree—a personality or individuality, which has its own susceptibilities, or affinities, immunities or aversions, and idiosyncrasies, physically and mentally. The human body fights infection and

attempts to heal or repair any damaged parts, no matter from what cause; it has such fundamental characteristics as, growth and powers of reproduction of its kind, in addition to its five senses; this is where it differs materially from the mechanical engine.

In every branch of study, in the world of science, the term "reaction" has its place. Nowhere can this term "reaction," better express in a superior force and manner, its necessary use, than in the study of pathology. In no other field can it imply a greater meaning. In the study of pathology there is a genuine manifestation of its actual proof of definition, which is: to act again or to act in response. This "reaction" of living tissues of the human body is known, in this case, as "inflammation." The reacting of tissues or the inflammatory process involves a phenomena or cycle which may be written scientifically as follows: injury from any cause produces a reaction which is an inflammation, resulting in hyperemia plus exudation, and terminating in a destruction of cell life—more or less—with a consequent proliferation of a connective tissue or both.

In all instances where there is present a more or less pathological condition, it has been conceded as a recognized fact that there is, primarily, some sort of an inflammatory process or a secondary condition of inflammation, attendant in any and all diseases, to a lesser or greater extent.

Therefore, while pathology is defined as, that branch of medicine which treats of the essential nature of disease, especially of the structural and functional changes caused by any diseased process,

the definition of inflammation is much more important, comprehensive, and to the point. So we may say: while pathology is the science which treats of disease, and deals with disturbance of functions, alterations in structures, and abnormal performances in living beings, all of which are induced by unusual agencies and conditions, which in turn produce the signs, symptoms and lesions of disease, we must add: inflammation being an important branch of pathology, we will proceed to define it.

Inflammation is the reaction of living tissue to an insult or injury; this insult or injury may extend, from a slight irritation (like sunburn) to destruction and death of many cells or perhaps an entire organ, for instance, the kidney or the lung. All will depend upon the extent and nature of the injury or insulting agency. This condition may be local or general in any part of the body or in any organ, and may be of a continual destructive or of a reconstructive character. The tissues pass through the stages of a momentary contraction of the capillary vessels, followed by a secondary dilatation; then there is a retardation with a secondary oscillation of the red blood cell, followed by a stasis and a diapedesis of the red blood cell and a subsequent migration of leukocytes (the white blood cells) generally of an ameboid movement character. As a result various tissue changes take place.

To be more explicit, we may say that "inflammation" is the evidence produced as a result of any insult to any part of the living body, or, "inflammation is the reaction of living tissue," caused

by any stimulation or injury. This reaction extends from a slight irritation to destruction and death of the cell or many cells,—of the tissues affected—in any part of the living body and is characterized by a discoloration or redness, heat, swelling, pain and—many times there is evident—a line of demarcation. This inflammatory process is always the result of bacterial, chemical, mechanical, thermol, electrical or other causes. There are a few instances in disease where we do not find the evidence—yet it may be present—of an inflammatory process, but this is the exception to the rule. Almost every one has heard of the condition known as a "cold abscess"; this is an instance of an infection by the invasion of the "bacillus tuberculosis" which breaks down the tissue structures and leaves a walled off area of pus or caseous material; there may also be a mixed infection condition with the "bacillus tuberculosis" predominating, in this case the result is similar, a mixture of pus formation; this condition does not come under the heading of inflammation, as a consequence we do not find the signs and symptoms of an inflammatory process, to-wit, redness, heat, swelling and pain, hence the name, a "cold abscess."

We say, "inflammation is the reaction of 'living' tissue to an insult or injury" for the reason that should one attempt to insult or injure a dead body by beating, burning, cutting or any other means, there will be no evidence of reaction, or inflammation, owing to the fact that the body is dead; in other words, when life goes out of the body nature has deserted it and there remains

no means of promotion of function, consequently there is no actual attempt of defense to preserve the life which is not there. It is a recognized fact that nature will make every attempt to defend itself against all insults and injuries and will also endeavor to heal the tissues of the "living body."

We are taught that every part, organ and minute cell of the human body has some particular function to perform which is necessary to the human economy and therefore essential to life. This, so far as we know, is true and holds good in every instance excepting one; it being proven many hundred times, by removal of the appendix that this obsolete organ—if we dare call it an organ—is not necessary to the well-being of humanity. The removed appendix has been subjected to all kinds of analyses and all manner of scientific investigations (known to man) with the resulting conclusion. The appendix in the human is said to be the rudiment of an organ which was once upon a time useful—perhaps many, many hundred years ago—long before the now human became a human, but was something else; the appendix has therefore outlived its usefulness and is at the present time an obsolete structure in our makeup, to-wit: it has no cellular construction of function, therefore performs no function. It is better out than in the body, because while there it may at any time cause trouble,—many times causing much pathology in the abdominal cavity—perhaps, resulting in death, but one does not feel that it is necessary to have it removed while it gives no trouble, nevertheless man is better off and can live very nicely without

it. This is perhaps the only instance where the human body is the owner of something which has no function and is not necessary to its well-being.

It has been said that the tonsils in the human might be classed with the appendix, inasmuch as they cause much trouble, and the individual can do very well without them. This is not true as far as science can determine. The tonsils are organs of function and have been called the catch basin of the human system, from the fact that the tonsils, intercepting all kinds of dust and bacteria, have the faculty—when in good health—of neutralizing or destroying these foreign bodies, this being their function; to guard the individual from infection. However, when the tonsils—for reasons known and unknown—lose their function they are better out than in the human. This is obvious, because the tonsils are in a position where they are easily accessible to the many kinds of infection and when infected cause many kinds of trouble or pathological conditions in different parts of the body.

We may now give a few illustrations of a "pathological condition" or a "pathological process." If the stomach in the human is an organ, and its sole function is a combination of container, capacity and digestion, why would it not digest itself, should any individual be so unfortunate as to be isolated from all food and drink? This is a fair question and has often been asked. Science gives us this answer: The stomach can not digest itself while it is alive and well. If for any reason the blood supply should be cut off from any part of the stomach wall—this condition occurring at times from many causes—that part, even though

it be only the size of a pin point, will eventually cease to function, because of loss of support and nutrition of the blood stream, and death of the tissues of that part ensues; at once this dead part is attacked by the gastric juices or bacteria and is treated as dead organic matter; it then becomes subject to the digestive process, the same as the organic food, such as meat and vegetables, when taken into the stomach. In many instances this explanation will also answer the question, what is the cause of gastric ulcer?

For example, we say, "typhoid fever" is an acute, infectious, contagious disease, characterized, clinically, by a roseola—papulary rash on the abdomen—a stepladder temperature chart, and a positive Widal reaction, and characterized, anatomically, by an invasion of Pyers patches of the ilium—the inner aspect of the small intestine—by the "bacillus typhosis," resulting in a pathological condition and characterized pathologically, by a primary irritation with a secondary inflammation and ulceration of this part, terminating in a cicatrization or a scar formation or perhaps in perforation of the intestinal wall. When we say, cicatrization or scar formation termination, it means there is a process of healing which leaves a scar where the original tissues were destroyed—by the bacteria and pathological process—and the patient fully recovers. When we say, termination by perforation, it means the pathological condition or ulceration does not heal and the process of destruction continues until it or the bacteria eats its way through the intestinal wall; when this happens, as a rule, there follows a serious condi-

tion known as peritonitis and death of the patient.

Tuberculosis is an infectious and contagious disease—but not considered a strictly contagious disease like small-pox and does not cause epidemics,—for the reason that it is only contracted by direct contact with one who has the disease, such as, mouth to mouth kissing (syphilis may be contracted in the same way) or by indirect contact, such as handling or using articles which have come in direct contact with the individual who has the disease, or by eating foods, or breathing dust, which contain the "bacillus tuberculosis." In other words, the "bacillus tuberculosis" must find its way into the human system. So we say: tuberculosis is an infectious disease which has no respect or regard for any part of the human anatomy and may run an acute or chronic course—depending upon the immunity or susceptibility of the individual—being contracted by inhalation, ingestion and innoculation, and is characterized clinically by a symptom-complex peculiar to this disease, depending upon the part or parts affected and location of infection, and characterized anatomically by an invasion of any part of the human body by the "bacillus tuberculosis," resulting in a pathological condition known as a "tubercule" or a "tubercular process," running a course of irritation, slight inflammation, a breaking down or destruction of tissue, an accumulation of a caseous material—cheese-like or pus-like in consistency—with a proliferation, or infiltration, or formation of a white fibrous connective tissue process circumscribing or surrounding the parts affected—which is nature's attempt to heal—and terminating in

either, an active process of spreading destruction of tissue, destroying the infected organ in part or in its entirety and spreading to adjacent structures or parts by contiguity or continuity, ultimately causing death. But in any active healing process, where the individual has a general resistance and immunity to this disease, the following takes place; first, the warding off of other locations of infection in different parts of the body; second, the ability of the body to destroy the "bacillus tuberculosis"; third, the power of neutralizing the toxins by a detoxicating process; fourth, the faculty of retarding or preventing the original infection from spreading by calling upon the reserve forces of the body to institute a protective process, which will surround this part—or this original "foci" or point of infection—with a scar formation or a wall of white fibrous connective tissue, and the individual becomes well.

Tuberculosis is contracted, first, by "inhalation," or by way of the respiratory tract and may infect any part of this tract with which the "bacillus tuberculosis" comes in contact; second, by "ingestion" or by the gastro-intestinal tract, when food or drink which contains the "bacillus tuberculosis" is taken into the mouth, or where the "bacillus tuberculosis" otherwise gains entrance to the mouth which may infect any part of this tract; third, by "innoculation" or by invasion of any part of the body by the "bacillus tuberculosis"; through any break in the surface of the skin or by any means or process whereby the "bacillus tuberculosis" is permitted to enter the superficial or deep tissues of the body.

In the study of the subject "Bacteriology" we learn more and more every day, that each micro-organism has individual characteristics, the most prominent of these being, the "special affinity for certain tissue" or "the preference in selection of tissues" best suited for a particular form or type of microörganism. This rule of "special affinity" or "preference in selection," for a particular part of the human anatomy or for any certain tissues, does not hold true in the case of the "bacillus tuberculosis." Here we again have the exception to the rule, in bacterial life. So it may be seen that the "bacillus tuberculosis" is in a class by itself, being marked by the distinctive peculiarity of "lack of discrimination in selection" when attacking any part or organ of the human body, or its "failure of respect and indifference of regard" for any tissues of the human. This characteristic—desultoriness relative to non-preference in location or choice of tissues—is worthy of notice. As a consequence, one may have a tubercular infection of any part of the body or several parts may be involved at one and the same time. Some of these conditions are known as, phthisis or tuberculosis of the lungs; cervical adenitis or tuberculosis of the lymph glands of the neck; scoliosis, due to tuberculosis of the spine; lupus, or tuberculosis of the skin; Addison's disease or tuberculosis of the adrenal gland; tubercular osteomylitis, or tuberculosis of the bone; tubercular meningitis, or tuberculosis of the brain; and so we may go on, mentioning all the various organs or structures in the human body, each having its own particular pathology and in every instance

giving rise to its special terminology, for the purpose of convenience, in the differentiation and treatment of these several conditions of disease, but all originating from the self-same or specific cause, the "bacillus tuberculosis."

When we lose one of our beloved ones—carried away by the so-called "galloping consumption" or tuberculosis of the lungs—and look back upon his history, we find, as a rule, these prominent facts: the beginning of the disease manifested itself at or about the age of puberty—between the ages of fifteen and twenty when there develops in youth a curiosity of learning and a craving for mental and physical excitement—when there is a tendency during this period to burn the candle at both ends, parties, dances and keeping late hours. In many instances there is an inclination—if the truth be known—to satisfy an increased sexual appetite which asserts itself, in this type of cases. All of these are important points to be considered and add fuel to the flame or help to burn out the life of the young and inexperienced youth. These known facts should cause us to exercise care and discretion when choosing intimate friends and should stimulate a personal regard for our actions in our associations of new and short acquaintance.

No longer is it advisable to keep secret the fact that "syphilis" is the primary factor in all cases of "locomotor ataxia"; here is an instance where it can be plainly seen how nature makes an error in its unguided and blind attempt to aid the unfortunate individual who has contracted "syphilis." To give a concise explanation of—"tabes dorsalis," the scientific name—the so-called "locomotor

ataxia," we may say it is the result of a truly pathological process which runs a course as follows: the invasion of the human body by an animalcule—the spirochæta treponema pallidum—which has an affinity for, or has the peculiarity of affecting the tissues of the spinal cord at a point where messages sent from the brain to the lower limbs are apprehended or interrupted; the tissues at this point, being destroyed, lose their function of transmission,—after a prolonged attack of the animalcule and its toxins; nature in its attempt to aid or heal fills in this space with a white fibrous connective tissue which has no function except to form a scar; as a result, no messages can be sent from the brain to the lower limbs and the individual loses the power of locomotion. This condition is defined, pathologically, as a degeneration of the posterior columns of the spinal cord, its principal marks being, incoördination and disturbance of sensation, with an ataxic gait, which is jerky and uncertain.

Syphilis is also responsible in many cases of "paresis" and insanity. It is also a well known fact—or at least it should be—that gonorrhea is responsible for blindness in the new-born, as a result of the father or mother or both having had the disease; chronic joint disease, rheumatism and many other conditions occurring after middle life, in a great many instances, are due to the fact that the individual has had gonorrhea some time in early life, each condition having its own pathological process the signs, symptoms and lesions of disease depending upon the parts affected.

We have said, upon microscopic examination of body tissue, in all diseased conditions, we find much evidence of a more or less destruction of cell life,—sometimes destroying an entire organ. These pathological processes are known as the regressive (going backward) tissue changes. Here there is always distinguished a complete change of cell life, in the different organs,—a gelatinous, lardaceous, waxy, or homogeneous mass—of different compositions and with a loss of nearly all original cell characteristics and function. These changes involve such terms as, atrophy (a wasting or shrinking) and the many kinds of degeneration, such as, albuminous, adipose (fatty) mucoid and colloid (mucus) hyaline and amyloid (waxy) calcareous (chalk or stone formations) pigmentation (coloring) and (death of cell life) necrosis.

Those men, tireless workers and seekers after truth, who have devoted much time and labor to experimental and practical work, in the field of "clinical and research" experience have earned the reputation of being authorities and are, therefore, the only criterions on the subject of pathology or disease.

The vital question in society is, when shall we conquer disease? It may be truly considered as an eternal question in our present day world. The term, "disease," meaning not at ease, or discomfort or discontent, is the general term used to express any deviation from good health. It may be applied to any condition which may be temporary and of a trivial nature, or it may be of a serious character with a tendency to permanency and a consequent cause of dire distress, not only

to the individual affected, but also to many others, especially members of his or her family. There are but few exceptions,—comparatively speaking, when we consider the many different kinds of disease (to which we are apparently heir) the human family has to contend with—where any disease of any importance cannot be traced to its etiology or cause, such as, infections, faulty metabolism or some kind of injury of a chemical or mechanical nature, or hereditary tendencies.

CHAPTER IV

IMMUNITY AND SUSCEPTIBILITY

OUR subject in this instance being of a two-fold nature, and closely related to bacteriology and pathology, is not an easy one to handle in the language of the laity. Especially is this twin subject the more difficult of explanation, since it is not only a product of modern scientific research, but is more or less composed of, first, many technical terms, all of modern coinage and invention, but derivatives of Greek and Latin words, in most instances, and combinations of mixtures of other languages, in other instances; second, it contains two sides of an argument, one in favor of the individual, the other against him; third, it has to do almost entirely with such things as, anti-toxins, serums, vaccines, bacterins, phylacogens, and several other modern discoveries which have found much favor, because of their virtues, in the up-to-date practice of medicine.

The term, immunity, is from the Latin, *immunis,* meaning, not subject to a munus or public service. It is a general term for exemption from liability, used originally perhaps, in a legal sense, applying to those individuals, who enjoy immunity from danger of arrest or other interference of any kind with their persons. In international law, the term, immunity ("not subject" or "not serving") implies exemption from the jurisdiction of the state which otherwise exercises jurisdiction

where the immunity arises. It is thus applied to the exceptional position granted to sovereigns and chiefs of states generally, and their direct representatives in the states to which they are accredited. In recent times this term "immunity" has been applied to the subjects of pathology and bacteriology, coupled with the term "susceptibility."

The term, susceptibility, may be defined as being, "the exact opposite of immunity." Aside from this, the term is not so easily explained; however, when the root of the term is run to earth, it gives this impression of its meaning; an individual may be captured and put in confinement, but under such conditions, that he remains a prisoner for the rest of his natural life, and sooner or later, the only termination is death. Under such headings as, electro-magnetism, terrestrial-magnetism and magneto-optics, we find, in different instances, the term susceptibility used as follows:

> —"this ratio is called the susceptibility of the magnetized substance, and is denoted by,"— etc.,
>
> —"the curves of permeability and suscepibility,"—etc.,
>
> —"It was first discovered by E. Villari in 1868 that the magnetic susceptibility of an iron wire was increased by stretching when the magnetization was below a certain value, but diminished when that value was exceeded,"— etc.,
>
> —"Important experiments on the susceptibility of oxygen at different pressures and temperatures were carried out by P. Curie."
>
> —"The susceptibility of air being known, that of liquid oxygen can at once be found."—etc.,

—"A small but decided tendency to a decrease of susceptibility in very strong fields was observed. It appears, therefore, that liquid oxygen is by far the most strongly paramagnetic liquid known, its susceptibility being more than four times greater than that of a saturated solution of ferric chloride."

—"There have been many recent determinations of the magnetic susceptibility of water."

All of these quotations are valuable evidence and worthy of notice, from the fact that we are speaking at all times of the primary elements of inorganic nature, especially oxygen and water. Here also may be seen, where and how the term was used many years ago in scientific work, later becoming a well meaning adoptive term, in the study of medicine and finally being applied directly to the individual or to the several conditions of the individual, relative to disease on the one hand, and to man's well-being on the other.

So we may say, by immunity is meant non-susceptibility to a given disease or to experimental and accidental inoculation of the animal body, with a given microörganism or a toxin. It being a known fact that there are various degrees of immunity, it may be stated in this connection that, conditions of local or general diminished vitality play an important part in the increasing of the susceptibility. Any animal body which is naturally susceptible to any particular type of disease, may acquire immunity, on the one hand, by having had the disease and successfully passing through its attack, or, on the other hand, by submitting to the various methods of inoculation or the so-called vaccination, and other prophylactic measures of

recognized worth, all of which has its place and effect, relative to the producing of non-susceptibility or the creating of an immunity in those individuals who have a susceptibility or who are prone to infection and affection by disease processes.

Under these conditions of this apparent criss-cross of cause and effect and somewhat topsy-turvy state of affairs, it will be necessary to lay an understandable foundation, or begin at the beginning with a tangible basis, that we may build as we proceed, not a house of cards, but an institution of much worth. This institution will be in need of good material of the concrete caisson and rock-bottom support variety, for mainly upon this human-citadel-like structure of the future, will all humanity lean most heavily. In the study of anthropology, the science which, in its strictest sense, has as its object the study of man as a unit in the animal kingdom, we find written:

> "The organized world presents no contrasts and resemblances more remarkable than those which we discover on comparing mankind with the inferior tribes. That creatures should exist so nearly approaching to each other in all the particulars of their physical structure, and yet differing so immeasurably in their endowments and capabilities, would be a fact hard to believe, if it were not manifest to our observation. The differences are everywhere striking; the resemblances are less obvious in the fulness of their extent, and they are never contemplated without wonder by those who, in the study of anatomy and physiology, are first made aware how near is man in his physical constitution to the brutes. In all the principles of his internal structure, in the composition and

function of his parts, man is but an animal. The Lord of the earth, who contemplates the eternal order of the universe, and aspires to communion with its invisible "Maker," is a being composed of the same materials, and framed on the same principles, as the creatures which he has tamed to be the servile instruments of his will, or slays for his daily food. The points of resemblance are innumerable; they extend to the most recondite arrangements of that mechanism which contains instrumentally the physical life of the body, which brings forward its early development and admits, after a given period, its decay, and by means of which is prepared a succession of similar beings destined to perpetuate the race.

"The problem of ascertaining how the small number of races, distinct enough to be called primary, can have assumed their different types, has been for years the most disputed field of anthropology, the battleground of the rival schools of monogenists and polygenists. The one has claimed all mankind to be descended from one original stock, and generally from a single pair; the other has contended for the several primary races being separate species of independent origin. The great problem of the monogenist theory is to explain by what course of variation the so different races of man have arisen from a single stock. In ancient times little difficulty was felt in this, authorities such as Aristotle and Vitruvius seeing in climate and circumstance the natural cause of racial differences, the Ethiopian having been blackened by the tropical sun and his environment. Later and closer observations, however, have shown such influences to be, at any rate, far slighter in amount and slower in operation than was once supposed.

"During the development of civilization, the conditions of man at the lowest and highest

known levels of culture are separated by a vast interval; but this interval is so nearly filled by known intermediate stages that the line of continuity between the lowest savagery and the highest civilization is unbroken at any critical point.

"An examination of the details of savage life shows not only that there is an immeasurable difference between the rudest and the highest lower animal, but also that the least cultured savages have themselves advanced far beyond the lowest intellectual and moral state at which human tribes can be conceived as capable of existing, when placed under favorable circumstances of warm climate, abundant food, and security from too severe destructive influences. The Australian black fellow or the forest Indian of Brazil, who may be taken as examples of the lowest modern savage, had, before contact with whites, attained to rudimentary stages in many of the characteristic functions of civilized life. His language, expressing thoughts by conventional articulate sounds, is the same in essential principle as the most cultivated philosophic dialect, only less exact and copious. His weapons, tools and other appliances, are the evident rudimentary analogues of what still remains in use among Europeans. His structures, such as the hut, fence and stockade, may be poor and clumsy, but they are of the same nature as our own. In the simple arts of broiling and roasting meat, the use of hides and furs for covering, the plaiting of mats and baskets, the devices of hunting, trapping and fishing, the pleasure taken in personal ornament, the touches of artistic decoration on objects of daily use, the savage differs in degree but not in kind from the civilized man. The domestic and social affections, the care of the young, the authority of the elders, are more or less well marked in

every savage tribe. There is usually to be discerned amongst such lower tribes or races a belief in unseen powers pervading the universe, this belief shaping itself into an animistic or spiritualistic theology, mostly resulting in some kind of worship.

"Lastly, chronicles and documentary records, taken in connection with archæological relics of the historical period, carry back into distant ages the starting-point of actual history, behind which lies the evidently vast period only known by inferences from the relations of languages and the stages of development of civilization. The most recent work of Egyptologists proves a systemic civilization to have existed in the valley of the Nile at least six or seven thousand years ago. From the combinations of many considerations, it will be seen that the farthest date to which documentary or other records extend is now generally regarded by anthropologists as but the earliest distinctly visible point of the historic period, beyond which stretches back a vast indefinite series of prehistoric ages.

"The teachings of history, during the three or four thousand years of which contemporary chronicles have been preserved, is that civilization is gradually developed in the course of ages by enlargement and increased precision of knowledge, invention and improvement of arts, and the progression of social and political habits and institutions towards general well-being.

"The existence of man in remote geological time cannot now be questioned, but, despite much effort made in likely localities, no bones, with the exception of those of the much discussed Pithecanthropus, have been found which can be regarded as definitely bridging the gulf between man and the lower creation. It seems as if anthropology had in this direction reached

the limits of discoveries. Far different are the prospects in other directions where the work of co-ordinating the material and facts collected promises to throw much light on the history of civilization.

"Geology has made it manifest that our earth must have been the seat of vegetable and animal life for an immense period of time; while the first appearance of man, though comparatively recent, is positively so remote, that an estimate between twenty and a hundred thousand years may fairly be taken as a minimum. This geological claim for a vast antiquity of the human race is supported by the similar claims of prehistoric archæology and the science of culture, the evidence of all three departments of inquiry being intimately connected, and in perfect harmony."

All of the above, with many other departmental branches of science, which has as an object the uncovering of the deep problem, the origin of man, tends to show that all these efforts have apparently failed, at least, up to the present. It is quite evident, however, in every scientific study in this direction, that there is an all important factor in the make-up of man which is responsible for his evolution. Is it possible that this dominating feature is the blood-stream, and that our present subject, "Immunity and Susceptibility," plays its part! Not only in our present day life, but from the early beginning, "Immunity and Susceptibility" was no doubt the all-important factor in creating, with the aid of the blood-stream, the basis of physiological function and its approximate relations of convolutions and evolutions eventually leading to the origin of man.

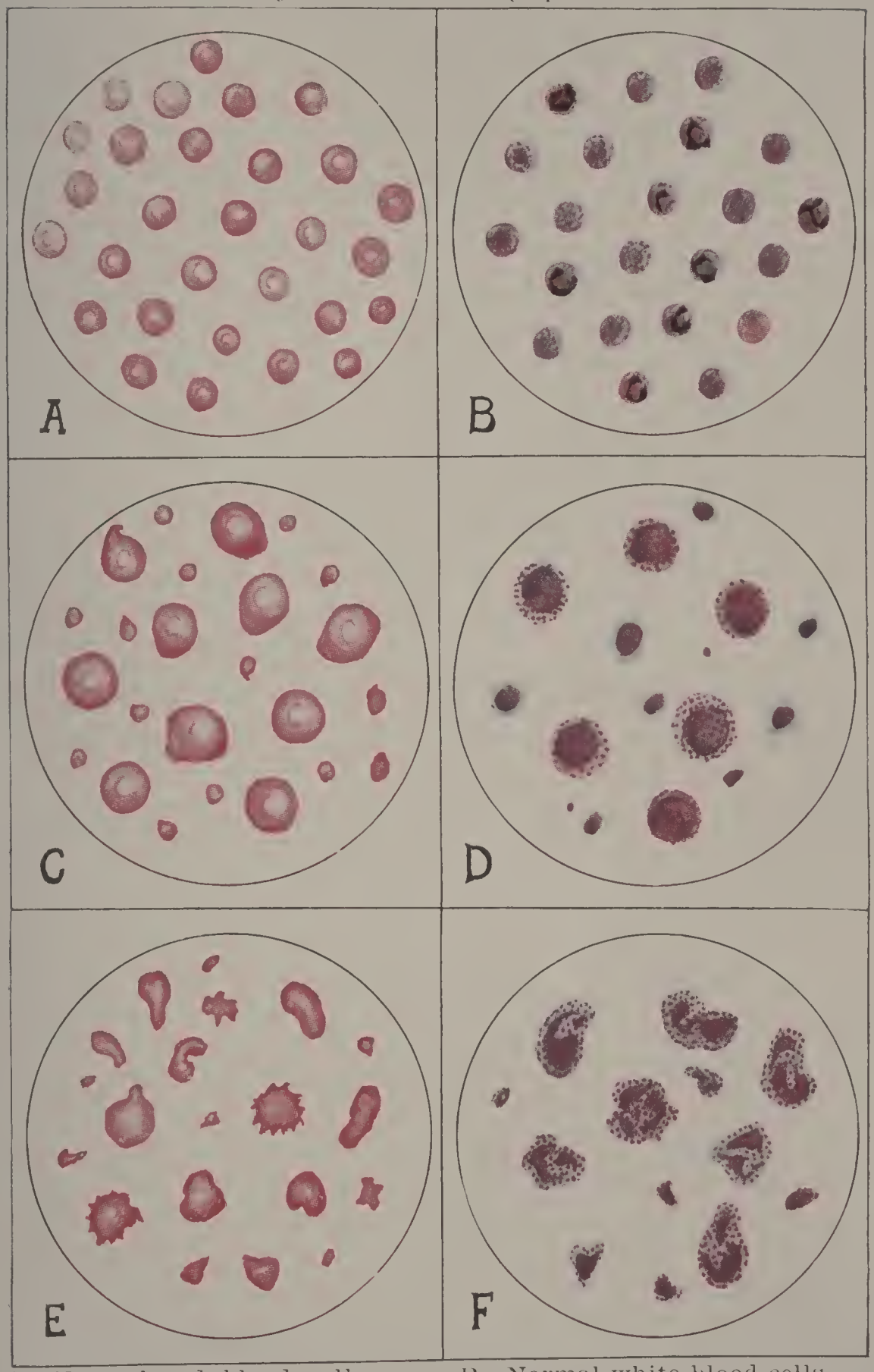
The "Blood" is the circulating fluid in the veins and arteries of all animal life. The word itself is common to all Teutonic languages; the English is blod; the Gothic, bloth; the Dutch, bloed; the German, blut. It is probably ultimately connected with the root which appears in "blow," and "bloom," meaning flourishing or vigorous. The Greek word for blood appears as a prefix, "hæmo-" in many compound words, in our language of today. The blood is constantly circulating or passing "to and from" every cell, in every organ in the human body. Each living cell has a function to perform, and from the (arterial) blood-stream they extract the food materials required for their sustenance; each cell produces a waste product, in the performance of its function, which accumulation would soon prove injurious to the cell, were it not being constantly removed; therefore it is discharged into the (venous) blood-stream, and finally carried away, and out of the body by way of the kidneys and other routes, peculiar to this complex human mechanism.

Everywhere throughout the body the individual cell is constantly bathed in a fluid which fills the tissue spaces. The metabolism of all cell life is carried on through the activity of these fluids. The blood is looked upon as the most important of all the body fluids, and yet it is only one unit of the various fluid phases within the body; it exerts, however, the controlling influence and is the principal dominating factor in the maintenance of normalcy, in the cell and organ, together with the function and all production as known in the human economy. In the blood are found impor-

tant signs pertaining to the "Immunity and Susceptibility" of every individual. Further, there are various degrees of "immunity," and in this connection conditions of local or general diminished vitality (from many causes) play an important part in the increasing of the "susceptibility."

Some individuals have what is known as a "natural resistance" to many pathological processes, which is sometimes called "hereditary immunity" or "congenital immunity," and this existing condition is considered the first in order; the second condition is the "acquired immunity," so-called from the fact that, in certain diseases, once the individual has successfully passed through an attack of the disease, he has automatically established a resistance (to that particular disease) which will (in many instances) last throughout his or her lifetime. Next in order comes the "active immunity," so called from the fact that, by the various methods of inoculation different substances are administered for the purpose of creating an "active influence" against certain diseases which generally last and protect the individual, by this "excited power" or "active immunity," over a long period of time. The fourth and last condition, known as "passive immunity" is only a temporary affair, and is generally applied to cases where a disease is present and when there is introduced into the human system of the patient, during or just before a severe attack of certain diseases, different substances which have the power to tide the individual over the disease, but only for the time being or during the passing of the disease or the creating of an "immunity" for

FIG. 2. RED AND WHITE BLOOD CELLS (human). As viewed under the microscope, and being subject to a staining process.



A. Normal red blood cells. Approximate size and shape.
B. Normal white blood cells. Polymorphonuclear leukocytes.
C. Abnormal red blood cells. The difference as to size.
D. Abnormal white blood cells. Large and small lymphocytes
E. Abnormal red blood cells. The difference as to shape.
F. Abnormal white blood cells. The difference in size and shape.

a short period. The last two conditions, when absent, can be brought about to a marked degree in many people, and has been practically applied for several years; it is sometimes called "preventive innoculation" against disease.

Insofar as the degrees of "susceptibility" are concerned, little is known relative to its subdivision, grades or stages, in the individual, but in groups or races it may be estimated. We may assume, however, that the degree of "susceptibility" may be studied in contrast to the "virulence" of microörganisms which produce disease, as to manifestations, which varies greatly with circumstances and under different conditions, prevalent at the time of illness.

CHAPTER V

METABOLISM

WE should mention, for the benefit of those who have not given the question any consideration and because the entire subject will be more easily and thoroughly understood by all concerned, that it has been definitely known for many years that the human body has many organs which produce what are known as "the products of gland excretion." The term "excretion" is limited to the process by which the end-products of tissue metabolism are removed from the body, the nature of the process, however, differing in no essential particulars from that underlying the process of "gland secretion." The several structures involved and the forces at work being of the same general character, we cannot draw any hard and fast line of separation between them. Should the body retain these products (the end-products) they would be detrimental to normal metabolism, therefore, their prompt removal becomes a necessity to the maintenance of the well-being in the individual. In such excretions as, urine, bile, perspiration, and others, are found the end-products of metabolism.

The most important of these glands or organs being the liver which produces the bile and pours it into the intestines, then we have the pancreas which produces the Amylopsin, Trypsin and Steapsin and also pours these into the intestines; there is the stomach which produces the Pepsin, Rennin

and Hydrochloric-acid, which mixes with the food. All of these glands and their excretions (and many more glands and their excretions, which we have not the time or space to mention here) are necessary to, and aid in, the process of digestion and assimilation of all liquids and solids taken into the stomach in the form of food. This process of ingestion, digestion and assimilation of food and its final excretion, principally by way of the urinary and alimentary tract, is known as "metabolism" or the "metabolic process."

Here may be seen a continuous cycle of cause and effect bringing about action and reaction as follows. Food is taken into the body; there are a number of glands which produce a product which acts upon this food to aid in its "process of digestion"; the nutritive substance obtained from this "process of digestion" is used to maintain life in the individual; as a result of this maintenance of life, two entirely different products are produced, by two separate sets of glands, one set "secreting" and the other set "excreting" some kind of material; in one set are found the kidneys and its allies, which produce a direct waste product; in the other set are found the liver and its allies, which produce an indirect waste product, being first used in the process of digestion; in this way we find there is a continual cycle of intake and output, with a secondary continual cycle of preparation for the maintenance of the first cycle, at all times going on in the human body.

In other words we may say that, within the human system there is constantly going on a building up and a breaking down process; this

is known in scientific terms as: Anabolism plus Catabolism, which equals Metabolism. We may find a much more satisfactory explanation in the following definition: anabolism, meaning to "build up," is the term used when speaking of any constructive process by which simple substances are converted by living cell activity into more complex compounds; catabolism, meaning to "break down," is the term used in any destructive process whereby tissue material has a passage from a higher to a lower plane of complexity or specialization; and metabolism, meaning to "undergo a change" is the term used to signify any "process" during the time while action of living cells or organs incorporate the matters obtained from food into a part of their own bodies.

Before proceeding further it must be stated that this subject has much to do with what is known as the "physiologic equilibrium," (the condition in which the amount of material taken into the body exactly equals the amount discharged) and connected herewith are the terms, "assimilation," (anabolism or constructive metabolism) and "dissimilation," (catabolism or destructive metabolism). All of which have to do with the fundamental facts of life in its continual and spontaneous acts of decomposition and reconstruction of all things taken into the human body in the form of air, as well as all liquids and solids which make up the food substances. It is a difficult matter—at times, in this day and age of scientific advancement—to determine just when cause becomes effect or effect becomes cause, in the disturbance of metabolism or the over-balancing of

the physiologic equilibrium, which is at all times necessary in the maintenance or preservation of good health and the well-being of life, and the part this disturbance plays in its production of detrimental effects, known as disease.

There is much evidence on record which goes to prove that, normally the cellular and molecular organization which constitutes the make-up of the human being is composed of a complex and delicate mechanism. Akin to this, there is also much evidence to show that, when this complex organization is interfered with in any way,—in this instance, by an overindulgence in large amounts of one kind of food or foods of the same order, such as, sugars, starches or salted meats, on the one hand, while not enough sugars or green vegetables would be detrimental on the other hand,—then there follows much disorder of function and evidence of disease process; this is known as faulty metabolism. When any pathological condition of this nature exists in the human body, the principal factors that must be taken into consideration are the foods, known as, carbohydrates, proteids and fats. While there are many pathological conditions brought about by a lost "physiologic equilibrium" or the interference with the normal action of any organ, insofar as science can determine, some of the more prominent diseases most frequently met with in the human being and caused by "faulty metabolism," are the following: diabetes, rickets, scurvy, pellagra, beriberi, and gout. All authorities agree that, in these conditions "faulty metabolism" is at least an important factor in the cause and effect and that,

the diet should be considered as an essential aid in the treatment.

It is important that we point out, in a brief manner, several instances of "equilibrium," so that we may recognize the full significance of these several other angles, relative to the "physiologic equilibrium." Equilibrium, (from the Latin, aequus and libra, meaning, being equal and a balance), is a term used to signify, a condition of equal balance between opposite or counteracting forces. By the "sense of equilibrium," is meant the sense, or sensations, by which we have a feeling of security in standing, walking and indeed in all the movements by which the body is carried through space. Such a feeling of security is necessary for maintaining any posture, such as standing or performing any movement. If this feeling is absent or uncertain, or if there are contradictory sensations, then definite muscular movements are inefficiently or irregularly performed, and the body may stagger or fall. When we stand erect on a firm surface, like a floor, there is a feeling of resistance, due to nervous impulses reaching the brain from the soles of the feet and from the muscles of the limbs and trunk of the body. In walking or running, these feelings of resistance seem to precede and guide the muscular movements necessary for the next step. If these are absent or perverted or deficient, as is the case in the disease known as "locomotor ataxia," then, although there is no loss of the power of voluntary movement, the patient staggers in walking, especially if he is not allowed to look at his feet, or if he is blind-folded. He then misses the guid-

ing sensation that comes from the lower limbs in particular; and with a feeling of uncertainty that he is walking on a substance offering little or no resistance, he staggers, and his muscular movements become irregular.

In animals whose limbs are not adapted for delicate touch nor for the performance of complicated movements, such as some mammals and birds and fishes, the guiding sensations depend largely on the sense of vision. This sense in men, instead of assisting, sometimes disturbs the guiding sensation. It is true that in "locomotor ataxia," visual sensations may take the place of the tactile and muscular sensations that are inefficient, and the man can walk without staggering if he is allowed to look at the floor, and especially if he is guided by transverse straight lines. On the other hand, the acrobat on the wire-rope dare not trust his visual sensations in the maintenance of his equilibrium. He keeps his eyes fixed on one point instead of allowing them to wander to objects below him, and his muscular movements are regulated by the impulses that come from the skin and muscles of his limbs. The feeling of insecurity probably arises from a conception of height, and also from the knowledge that by no muscular movements can a man avoid a catastrophe if he should fall. The bird depends largely on visual impressions, and it knows by experience that if launched into the air from a height it can fly. Here, in all probability, is the explanation of the large size of the eyes of birds. Cover the head, as in hooding a falcon, and the bird seems to be deprived of the power of voluntary move-

ment. Little effect will be produced if we attempt to restrain the movements of a cat by covering its eyes. A fish also is deprived of the power of motion if its eyes are covered. But both in the bird and in the fish tactile and muscular impressions, especially in the latter, come into play in mechanism of equilibrium.

There is another channel by which nervous impulses reach the sensorium and play their part in the sense of equilibrium, namely, from the semicircular canals, a portion of the internal ear. It has been pointed out, under the study of the "Hearing," that the appreciation of sound is in reality an appreciation of variations of pressure. It is the action of the mechanism, contained in the labyrinth of the ear, produced by sound-waves or musical tones which causes us to hear. It has been found by physicians and aurists that injury of the canals, occurring rapidly, produces giddiness, staggering, vomiting, noises in the ear and more or less deafness. It is said, however, that if pathological changes come on slowly, none of these symptoms may occur.

The term "metabolism" is from the Greek term, "change" or "alteration," and is used in a biological sense for the process of chemical change occurring in the living cell. All disease is primarily due to "alterations" or "change," quantitative or qualitative, in the chemical changes in the protoplasm of some or all of the tissues of the body. While in some pathological states these modifications lead to structural changes, in others they do not produce gross lesions, and these latter conditions are commonly classified as "Functional

Diseases," being caused by "faulty metabolism." When such functional disturbances affect the general nutrition of the body they have also been termed "Metabolic Diseases." It is indeed a difficult matter and almost impossible to draw a hard and fast line between functional and organic diseases, since the one, as a rule, passes gradually into the other, as is well seen and known in gout, manifesting itself in various ways and attacking various tissues and parts of the body; also in diabetes, followed by gangrene and other pathological conditions; all of which are secondary signs, symptoms and lesions of disease. Nor is it always easy to decide how far the conditions are due merely to quantitative alterations in the metabolism and how far to actual quantitative changes, for it is highly probable that many of the apparently qualitative alterations are really quantitative disturbances in one part of protoplasmic mechanism, leading to an apparent qualitative change in the total result of the activity.

The knowledge thus far acquired from analyses of vital phenomena and their changes under the influence of stimuli affords but a very indefinite temporary basis for the theory of the actual vital process itself, of which vital phenomena are the outward manifestation. The fundamental fact of life is the metabolism of living substances which is continually and spontaneously undergoing decomposition, and building itself up anew with the help of the food-substances it takes in. The vital phenomena of the cell may be derived mechanically from metabolism and the changes it undergoes under the influence of stimuli. Our knowl-

edge of this will increase more rapidly as we become better acquainted with the details of the metabolism of the cell itself. The relations already known are so exceedingly complex that only by slow degrees can we pursue the investigation of separate fragments of the entire metabolic series.

The differentiation of nucleus and protoplasm in the living substance of the cell alone gives rise to an extraordinary complication in the metabolic process, for these two parts of the cell stand in the most complicated correlation with one another as well as with the environing medium; a fact which experiments have proven in the various free-living cell-forms, and wherein and whereby have been furnished abundant evidence. The farther such knowledge advances, the more rounded, clear and free from hypothesis will become our conception of the cell's metabolism. But the cell is the elementary component part of all organisms, and from the life of individual cells is constructed the life of the separate tissues and various organs, and thus of the entire organism. Hence the cell is the only vital element which the organ possesses, and therefore the investigation of the vital process in its separate cells leads ultimately to a knowledge regarding the mechanism of life in the whole.

PART II

NATURE'S WORK AND ORGAN TRANSPLANTATION

WE will find in this part a concise description of the following:

The transplantation of organisms in its many phases, as known to man, in all of nature's family, composing the different groups and their manifestations of life, as found in the atmosphere around the earth; in and on the earth surface, and in the small and large basins of the earth, which contain water.

The vital glands in the human body and the possibilities of transplanting them from man to man, or from the lower animals to man, when such glands, especially in the human, become useless to the body, from disease, injuries and other causes. The possibilities and probabilities of success and of failure in the interstitial gland transplantation operation in the human being and in animals. The methods used today, in gland transplantation, being considered from its many angles. The relating of the logical causes and reasons why the transplantation operation is a failure, with the probabilities and possibilities of dangers to the individual, by the use of present day methods in this operation; the essential need of more knowledge relative to a new surgical technique and of new tests in this field of work.

The laws of nature which govern or control the organs in the human, relative and necessary to the reproduction of its kind. In the human we find involved, first, the secret inclination of nature's demands which lead to the combined act of the male and female, resulting in conception. In some instances, or at times in some individuals, nature's laws exceed the mere inclination or natural desire and become or take on the form of a dominating and impelling force or a taunting tendency and goading action on the part of human nature, resulting in an abnormal desire. Second, the automatic transplanting of the female element of reproduction, the ovum or egg, from the ovary to the fertile field of reproduction (the uterus) in the female, and third, the transplanting of the male element of reproduction, the spermatozoa, from the gonads—involving its many stages of automatic production and the different steps in its delivery—to this same fertile field; fourth, nature's deliberate transaction of apparent precision, its latent but viable, invisible and apparently unguided process of amalgamation or the combining of both these elements in this same fertile field, culminating in the perfection of the human and the maintenance of a continuous cycle of life, involving the following stages, production; transplantation; fertilization; pregnancy and parturition which is the act or process of giving birth to a child; as a result of this cycle we have the propagation of the race. Fifth, the consideration of the laws and forces which develop and protect the primary elements, (the ovum and spermatozoa) the embryo (the unborn child in its primary stage

after conception occurs) the viability of the child in the last stages of pregnancy (before birth) and the physiological process of delivery of the child into the outer world; after birth takes place, the part played by nature in the developing and protection of the individual throughout life.

The body power of production and reproduction. In one class we find the divers things produced, by processes of secretion or excretion within the individual (here may be mentioned a few) the production of which are necessary factors, in the human economy. The digestive gastric juice, which is a mixture of hydrochloric acid, pepsin and rennin, is produced in the stomach, by the functioning of the different cells, contained within the lining of the inner wall of the human stomach. The bile, which is sometimes called the gall, because of its bitter taste, is manufactured in the human liver; it is green or golden brown in color, contains water, salts of different composition, fats in combination, cholesterin (which is said to have the power of neutralizing snake-venoms, and causing an immunization against them) lecithin (this substance is of both animal and plant origin and is said to be anti-venomous, its properties being antagonistic to poisonous insects) and various pigments. The above mentioned (gastric juice and bile) products are said to have a marked influence upon the system of digestion, especially when brought in contact with the products of the pancreas, an organ which creates (by an unknown method) the following substances: amylopsin (sometimes termed, the amylolytic enzymes) which converts or transforms

starches into sugar; trypsin (sometimes termed, the proteolytic enzymes) which has the power to aid in the digestion of proteids (it also dissolves gelatin, elastic substances, certain membranes and tissues, such as meat we eat); steapsin (sometimes termed, the lipolytic enzymes) the action of which consists in the cleavage of fat substances into glycerin and free fatty acids, in the waging of a destructive and constructive process, which has much to do with the digestion and the changing of foods into the necessary saponaceous nature or state. In another class are found those apparently hidden animated attributes (from unknown sources but which are possibly produced in and by the chain of endocrine glands) containing the primary elements, maintaining the secret process of procreation, which go to make up in its termination the ability of delivery, by the human, of those constituents which possess the power and function of impregnation for the purpose of propagation of the human race.

Consideration of that so-called "personality" or "individuality" and the future possibilities of solving this world-wide problem which has puzzled all humanity and men of science for many years. The importance of possessing these qualitative elements or "important factors" in the proper quantitative amounts or degrees, when striving for success in the different vocations of life; the apparent necessity of every individual containing, at least, a certain amount of these same "important factors" in the "struggle for life," in accordance with the laws of the "survival of the fittest."

CHAPTER VI

THE GLAND OPERATION

"Come forth into the light of things; let Nature be your teacher."
—*Wordsworth.*

THE more recent interest in the "Monkey Gland" treatment is simply a revival of the work done in France some thirty years ago. About the same time, in Paris in 1889, the fluid extract of the gonads of the dog was used, being introduced into a man, subcutaneously. Since that time many experiments have been done on both lower animals and man, with little or no results of a material nature. Just a few years ago the use of the "Goat Gland" method gained some little publicity and was advocated by some as giving the best results. These treatments, both goat and monkey, however, after being subjected to a crucial test of investigation, did not sustain their claims and they, too, were then thrown, with all others, up-to-date, into the scrap heap. Our purpose is not to discuss in particular the so-called, "Interstitial gland transplantation operation," as it is being done today, but rather to throw some light upon the slow advances made in the art of surgery, especially in the particular field of operation, known as the transplantation of all organs or organisms, a field in which there is opportunity for vast improvement, and of which the human family stands very much in need. If, however, it is inci-

dentally proven to the satisfaction of all concerned, in our writing, that this so-called "monkey or goat gland" treatment is nothing more or less than a "Mythical Farce," it is not any special intention, but may automatically occur as being such, in the process of disclosing certain facts in the case of the so-called "Interstitial gland transplantation operation," as it is done today. At times, when we are sure of our ground let us stand firmly upon the facts in our possession and have the courage of our own convictions, without prejudice or partiality, and with a placid deliberation, in a resolute and logical manner, "Hew to the line, let the chips fall where they may." Should there be exposed, by incontestable proof, formulated on a scientific basis of deduction plus practical experimentation, plus the attack from every possible standpoint of reason, the flaws and fallacies contained within the argument and contentions, as to the relatively true merits in any theory, especially as to its relative truth and accuracy as a practice; then the human race will surely have gained something, making for a healthier and happier life. Only, in this way, can we proceed in all branches of medicine and surgery, step by step, achieving our victories one by one, until we thereby attain the long sought "Millennium."

This is a world in which we, "live and learn," provided, we will use our "powers of observation" in the full sense of the words; but, unfortunately, there are those among us who live and learn not, and we must expect to find them in so large a group as the human family and place them in the class, with "There are none so blind as those who

will not see." As a result of this blindness or ignorance, there are many who become ill, sometimes invalids for life, from over indulgence, physical neglect and excessiveness, bacterial infections, lack of proper nourishment; directly or indirectly, intentionally or unintentionally, as the case may be. There are however, two instances, in particular that we know of, where the individual is not at fault; one instance is, where nature, for many reasons, known and unknown, has failed to perform her functions properly, in other words, nature has failed to produce a normal and healthy child, when to all appearance, nature should finish her work and produce that normal and healthy child; at times, we are at a loss to explain this delinquency on the part of nature; at other times, we know that nature was not delinquent, but was handicapped in her work by a disease, for it has been written, "The sins of the father and the mother, are visited upon their children, even unto the third and fourth generation." As to whether or not this disease is a sin, is a question not to be discussed at this time. We can readily see the significance in the writing. The other instance is the congenital or hereditary tendency of the several susceptibilities to any disease, disturbance or disorder, each belonging in its own particular class and which may or may not leave its mark upon the parent or upon the child of the parent, acquired or congenial, "Even unto the third and fourth generation," before or after birth."

There has been of late years much talk and publicity, relative to the interstitial gland transplantation operation and the wonderful results ob-

tained by the individual after this operation. The public in general have been led to believe, in a rather doubtful and confusing manner, that great benefits can be obtained, or wonderful cures and marvelous results brought about by an operation of this nature. It has been stated that it will grow hair on the head, and in some cases cure rheumatism. That it will improve the voice and complexion. That it will cure diabetes and tuberculosis and in fact cure any and all diseases of mankind. Also, that it will make you young again, bestowing upon an elderly individual, all the vim, vigor and vitality of youth. To all the above claims there is some little foundation, but very little of a definite character and none proven true, as far as an operation for the interstitial gland transplantation is concerned. As we read, we can see where the theory was derived from, and where this hypothesis is to blame for all of the above statements, as to their relative merits, in this operation. While it is a possibility and quite probable that great things may be accomplished in this field of work, in the near or far future, it is safe and sane to say, that today, this so-called, interstitial gland transplantation operation is only an experiment, and should be performed only as such.

All new theories of a momentous nature, especially in the medical profession, gather more or less momentum and force by the publicity of the daily press, encouraged as it is, by the anxiety of the vast numbers of human beings who are in need (at all times) of medical care and advice, also those of the morbid curiosity type; and principally the moron in its various degrees of affliction whose

trend of mind is diseased and which may be stated, as, "those who are ill in mind and know it not," all should be considered. It is well to advise the public in general, that they may do some investigating for themselves, before undergoing an operation which may be absolutely useless, perhaps harmful, and possibly fatal. It is admitted and advocated by many investigators, that we may expect great things from this source of study, but up-to-date there is very little knowledge which may be called definite, in this operation. How are we to judge as to the relative merits and logical sequence of this operation in any case, especially, those of general debility or loss of youth and vitality? If we are to use our judgment in this matter, it is necessary that we resort to a "logical means in general," in so doing.

After the schooling and educating of the human being,—of the so-called intelligence, or the unknown power of mental capacity to grasp this intelligence,—there travels hand in hand, in some individuals, consciously or unconsciously, a so-called "tact for business," or, as termed in the olden days, success in the application of "barter and trade." In these men we find a subtle mind, of the, "crafty thought for gain," variety. This is admitted by the world in general as a trait of genius in the commercial man or merchant, while at times it may be termed, as anything but genius in the medical man. It, therefore, requires a hard and remorseless logic with which one would arm oneself as with a sword of cold and tempered steel, with which to combat this apparent perversion of duty, performed no doubt, in all righteous-

ness in the mind of some individuals, surgeons whose "inner sense," is in reality and truly that of the merchant. We find written, "The key of knowledge ye hid; ye entered not in yourselves and to them that would enter in, ye opened not."

Logic arose, at least for the Western world in the golden age of Greek speculation which culminated in Plato and Aristotle. There is an Indian Logic, it is true, but its priority is more than disputable. In any case no influence upon Greek thought can be shown. The movement which ends in the logic of Aristotle is demonstrably self-contained. Logic cannot dispense with the light afforded by its history so long as counter-solutions of the same fundamental problems continue to hold the field. A critical review of some of the chief types of logical theory, with a view to determine development, need no further justification. Logic is the science of the process of inference. What then is inference? It is the mental operation which proceeds by combining two premises so as to cause a consequent conclusion. In the main there are three types, analogical, inductive and deductive.

So it may be said, by logic we eventually arrive at the place of passing judgment, and judgment in general is the mental act of believing that something is, or is not, determined. Consequently we have the verbal expression of such a belief. Finally, though sensory judgment is always true of its sensible objects, inferential judgments are not always true, but are true so far as they are logically inferred, however indirectly, from sense; and knowledge consists of sense, memory after sense

and logical inference from sense, which, we must remember, is not merely the outer sense of our five senses, but also the "inner sense" of ourselves as conscious thinking persons. We come then at last to the question, What is truth? Truth proper as Aristotle said in the metaphysics, is the mind; it is not being, but one's signification of being. Its requisites are, that there are things to be known and powers of knowing things. (It has been written "A man shall not hesitate to ask concerning [himself and] his place in the kingdom. Ye shall know. Everything that is not before thy face and that which is hidden from thee shall be revealed unto thee. For there is nothing which shall not be made manifest, nor buried which shall not be raised.") It is an attribute of judgments and, derivatively, of propositions. That judgment is true which apprehends a thing as it is capable of being or known to be. Or, to combine truth in thought and in speech, the true is what signifies a thing as it is capable of being known. Secondarily, the thing itself is ambiguously said to be true in the sense of being signified as it is. Truth, then, is not the agreement of knowledge with an object beyond itself, and therefore unknowable, but the agreement of our judgments with the objects of our knowledge. A judgment is true whenever it is a belief that a thing is determined as it is known to be by sense, or by memory after sense, or by inference from sense, however indirect the inference may be, and even when in the form of inference of non-existence it extends consequently from primary to secondary judgments.

The aim of logic in general is to find the laws of all inference, which, so far as it obeys these laws, is always consistent, but it is true or false according to the data as well as its consistency; and the aim of the special logic of knowledge is to find the laws of direct and indirect inferences from sense, because as sense produces sensory judgments which are always true of the sensible things actually perceived, inference from sense produces inferential judgments which, so far as they are consequent on sensory judgments, are always true of things similar to sensible things, by the very consistency of inference, or, as we say by parity of reasoning. We return then to the old view of Aristotle, the truth is believing in being; that sense is true of its immediate objects, and reasoning from sense true of its immediate objects; and that logic is the science of reasoning with a view to truth. All we aspire to add is that, in order to attain real truth, we must proceed gradually from sense, memory and experience through analogical particular inference, to inductive and deductive universal inference of reasoning. Logic is the science of all inference, beginning from sense and ending in reason. In conclusion, it may be said, seemingly, the logic of the last quarter of the 19th century may be said to be animated by a spirit of inquiry, marred by a love of paradox and a corresponding hatred of tradition. But we have found, on the whole that the logical tradition rises superior to logical innovation. In other words, we may say, "truth," is what the seekers after "truth," find, as a consequence of a certain number of definitions, axioms, paragons and postulates, accepted as

known facts and used as a tangible basis upon which we work, in making final deductions, when giving expression in words as to the result of our work, in some particular study, by a sane and sound life of reason. Again we find written, "Let not him who seeks, cease until he finds and when he finds he shall be astonished; astonished he shall reach the kingdom and having reached the kingdom he shall rest."

When we use the term "Kingdom" in quotations, this term may justly be translated into "heaven" or "millennium" and have practically the same meaning; "Kingdom" no doubt was the vernacular of those days, while "millennium" is a term of today. There is no question as to the holy Bible being our oldest and greatest history and the character "Christ" was indeed a good and wise man, one who lived and died before "His" time, as many good and wise men have lived and died, from the day of the "Crucifixion," up to the present day, paying the penalty of suffering many tortures and death; not because they were good and wise, but, because perhaps, their ideas and opinions were detrimental to the political or commercial intrigues and machinations of the knaves of the times. We, therefore, find in history, the character, the "Savior" which stands out clear, over and above all other things and the fact that "He" was a good and wise man. Nowhere do we find during "His" career upon earth, the manifestation of the tendency of "barter and trade," which is in itself a strange and significant instance, of the revolutionary departure of the individual, from the hereditary characteristics of his race, and the

man of those times upon earth. "He" whom, we say, walked through life "barefooted" and who came to show us, "how to live and how to die." All this is worthy of note, when we consider, He was himself a "Jew."

CHAPTER VII

ORGAN TRANSPLANTATION

LITERALLY, millennium, a period of a thousand years, means little or nothing, but the term is used today to depict in the mind of man a conception of a time in the future when all flaws in human existence will have vanished; when harmony and happiness will prevail; the day when Love, Truth, Justice and Goodness will govern all things upon earth, and Man's life will be complete.

It has been written, "in six days God created the world, on the seventh He rested." But a day of God is perhaps equal to a thousand years. Hence, it is said the world will last until six thousand years of toil and labor have been spent. Then will come one thousand years of Sabbath rest for man. Is this seventh millennium to be the end or will it be followed by the eighth day of eternal duration, and then the day of judgment?

All Philosophical and Theological speculation will be abandoned for the time being, and, in fact, all views with the exception of "The Millennium" which the physician contemplates in the practice of medicine. All new ideas born in the mind of Man are at first phantasms or idiotic, impossible imaginations, then wild dreams of a thinking mind. For instance, modern chemistry and surgery, the Phonograph, Wireless Telegraphy, and many more. Then one day, behind locked doors or somewhere away from the criticizing cynics and public

gaze, the scheme is tried, or the experiment is made and proven a success.

I would now speak of the "Transplantation of all organisms," meaning, all parts of the human body, a subject, or should I say, a theme on which there cannot be found one single book written,—that is to say, no book of an authentic nature; it is true there has been much publicity given to the subject, in recent years, by newspapers, magazines and novels, all of which are sadly lacking and many times misleading, as to the material facts and none of which can be construed as coming from a reliable or dependable source; all seemingly appeal only to the idle, sometimes, morbid curiosity—and very little literature of an authentic nature could be obtained which was devoted to this subject. How long will it be before the medical student will learn from his text book the secrets of the process which takes place in the transplantation of an organism? How and when will this great task be accomplished? This is a question in which every human being should be interested.

When we trace in broad outlines the record of man on earth, it brings forward the story since the nebulous time when the "Man of the Drift," was struggling for existence amidst the Wild. The earth is Man's tomb and with him lie buried the evidence of his progress from savagery to civilization. This mass of testimony accumulates from the earliest period of his record on earth. In his burial he has written his history.

Scarcely less interest attaches to Prehistoric than to Historic Man. The stones he cut and shaped into weapons and crude tools attest his

kinship to all men who have come after him. The age of Stone is but a step towards the age of Steam and Steel. In that far away day Man turned his eyes towards the same mysterious heavens that meet our wondering gaze. The winds and the tide, the succession of the seasons, the course of Nature were then as now. He groped for higher things as do men today.

The Prehistoric World was a stage of Man's existence; of the transition to the Historic stage we know less than we would know, yet we find a record that shows that the transition covered a long period of time. Almost without notice, Man emerges from the dawn and mists of his past into the culture of the Orient; Egypt with its Obelisks and Pyramids, the Far East, famous for the wonderful and grand Architecture, Greece, Rome—and we may say the next morning we awaken to behold the Sun shining on the Modern World.

It is the large record of Man that interests us; little events slip past unnoticed,—only the essential and abiding arrest the mind. It is Man's career on the earth as a rational being, marked by his capacity to adapt himself to the organic world in which he moves that essentially concerns us. The law of civilization is the law of adaptation. Why cannot we, from a standpoint of medical science, make the law of adaption the law of civilization? In other words, why cannot we, with all the discoveries of modern science at our command, remove any objectionable organ from the human body and replace it with a more efficient one?

Transplantation, grafting, or the inserting of living tissues may be in the form of organisms,

limbs, skin grafting, mucous and serous membrane transplantation, or transplantation of periosteum, perichondrium and vessels; transplantation of teeth and bone, properly speaking, does not occur, this being implantation. Implantation, while a similar process, does not demand the use of a "living tissue" as a graft. This field of work must necessarily come under the jurisdiction of the Surgeon. But at the same time the Physiologist and Zoölogist must be given some consideration, as most of the work, to the present time, in this field of operation has been performed on animals.

To begin at the beginning, Cytology, the study of cell life, informs us that the cell theory ranks with the evolution theory in the far reaching influence it has exerted on the growth of modern biology.

The phenomenon referred to by many authors, that cells of like order attract one another seems to be the main theory upon which all operators depend. It is known that sudoriferous glandular epithelium may be transferred into cuticle epithelium, but not into nerve cell. Connective tissue may become transformed into cartilage or bone, but not into muscle—and parathyroid into thyroid, but not into kidney or liver.

Transplantation of protoplasm is of the widest occurrence in nature. In plants, the male element or pollen is carried to the ova (the female element of reproduction). Gravity, or air currents are the most important direct carrying agents in some instances,—as Indian corn or maize, whilst insects play important rôles as transmitters. Frog's ova are deposited outside of the body along with an

abundant supply of food material, and the sperm of male elements are deposited on the eggs (or ova) outside of the body, thus maternal and paternal elements are united outside of the body, but inside the body, the ova are transplanted from the ovary to the uterus (womb) and the sperm from the male into the ova (inside the uterus). Such is the natural process of fertilization and the resulting organisms may or may not present identical objective characters of those of the parents. By artificial means it is possible to remove the fertilized ova of some mammals and successfully grow them by placing them in the uterus of another animal.

Another form—propagation of plants by cuttings.

The remarkable results obtained by grafting in arboriculture and gardening are familiar, and low forms of animals show a great readiness for growth if they are grafted; with the warm blooded animals however, this is by no means the case. One may make a general statement to the effect that immediately after grafting the tissue inserted may grow—perhaps into a tumor,—yet in a comparatively short time the planted tissue becomes absorbed and a cicatrix alone may remain, although sometimes the graft forms a frame work upon which the regenerated tissue fills in the area. Even in this short period of growth after transplantation it is often notable that the proliferation of the transplanted tissue occurs through generations of cells that gradually become less specific. *Expressed in other words, there is at once reversion in the type of the cell transplanted.*

As far back in history as the 16th century, when scientific zoölogy began, and even to the present day, Zoölogists have studied the lower animals from every angle, and one of the principal branches of the study, which has received special attention of late years and at the present day, is the transplantation of specific organisms. The curiosity of Zoölogists has long been aroused to know whether the reproductive glands of a vertebra can be successfully transplanted from the body of one individual to another, and if so, will the gland thereafter functionate in its new environment, and if it does whether the nature of its products will remain unaltered. The fact has been repeatedly pointed out that experiments of this sort, if successful, should afford a crucial test of the Lamarckin and the Weisinannian views, respectively, the relation of the germinal substance to its environment, and in particular to the body.

Outside the scientific world an immense mass of observation and experiment has grown up in relation to the subject of breeding. From the earliest times the Shepherd, the Farmer, the Horticulturist and the Fancier had for practical purposes made themselves acquainted with a number of biological laws and successfully applied them without more than an occasional notice from the academic students of biology.

It is one of Darwin's great merits to have made use of these observations and to have formulated their results to a large extent, as the laws of variation and heredity. It would not be so wonderful a discovery today to find that after the transplan-

tation of organs had been perfected to some extent we could prolong youth, and therefore, Life, for many years. Heredity should not be lost sight of from the fact that every member of the human family being to a greater or lesser extent a victim of its environment, would, perhaps in time, become accustomed to the process and profit thereby. When we regard the subject matter of this process which may develop into a new science and which we may term "Renewed Life," for want of a more scientific name, we can readily see it is not surgery, zoölogy or physiology, but a combination of the three in one. No doubt it will form part of the studies of the collector and systematic Zoologist who will co-operate with an efficient surgeon,—one who has pursued the studies of organic and physiological chemistry and physiology from a medical standpoint—with only one object in view, namely, the "Transplantation of Organisms."

Whenever the breeder selects a congenital variation which suits his requirements, and by breeding from the animals (or plants) exhibiting that variation, obtains a new breed specially characterized by the variation, so is it demonstrated in nature that there is a selection amongst the congenital variations of each generation of a species. This selection depends on the fact that more young are born than the natural provision of food will support. In consequence of this excess of births there is a struggle for existence and a survival of the fittest. Consequently an ever present necessarily acting selection which either maintains accurately the form of the species from generation to generation or leads to its modification in cor-

respondence with changes in the surrounding circumstances which have relation to its fitness for success in the struggle for life. We may observe an occurrence or living demonstration of the above statement, in every day life by watching the growth and development of a litter of pigs, cats, dogs or other animals, from birth. In almost every instance there is a so-called stunted one who is apparently sickly or weak. This stunted one is pushed aside and deprived of its nourishment by the others "in the struggle for existence." If the stunted one survives it will remain stunted or abnormal through life, as a rule it dies, being physically unfit. This stunted one, if it lives, is never used for breeding purposes.

In the transplantation of an organism, indications are that it will struggle for life as all cell life will, provided, however, it is given succor along the lines which it requires for that life. For instance, there is on record a case of heteroplastic ovarian grafting followed by pregnancy, the bearing and delivery of a living healthy child with no evidence of ill results to either mother or child. The operation was performed by Dr. Morris of New York, on February 11, 1902. In reference to this case Dr. Morris writes: "I have done heteroplastic ovarian grafting in fourteen cases and this is the only one, to my knowledge, where the mother has given birth to a living child." In this case the ovaries of Mrs. P. were transplanted in, or transferred to Mrs. W. Dr. Morris says: "In the case of Mrs. W. it is probable we have an instance of tolerance of the tissues of Mrs. P. that may have amounted to complete tolerance." It

will also be interesting to watch the case and note who the child resembles, the husband of Mrs. W. or Mrs. W. herself, or perhaps Mrs. P., or someone of her family. (Dr. Morris gives no absolute proof that the operation was actually responsible for the birth of the child, in the one case out of fourteen. Until such proof is shown by satisfactory demonstration, it is quite natural to believe and reasonable to assume that, this mother would have undoubtedly and in all probability given birth to a child regardless of this operation. It is quite possible that nature was slowly but surely preparing this expectant mother for conception long before the operation was performed, because it is an established fact, that some females of the human race require a long period of stimulation in married life, before conception takes place.)

It is important to experiment along these lines with animals so we may prepare animals for tolerating the tissues of each other. While this idea may not appeal to the "I am holier than thou" reformer or to those who are opposed to what is known as, venesection and animal experimentation, it would be well for these so-called reformers to ask themselves: "What about the infants who cannot tell their troubles to the mother or physician when ill?" Which is the lesser of two evils? Shall we let the innocent suffer the agonies of death, or, experiment on animals and save the child? It may be said, it is within the realm of sane and sound reasoning, that if the "I am holier than thou" reformer who is continually interfering in all animal experimentation, which is at all times done under the most humane circumstances pos-

sible, would do less interfering in scientific research and investigation, being conducted by those who seek the truth and knowledge of all pathological conditions afflicting the human race, there is a great possibility that the study of medicine and surgery would be much farther advanced and the physician would be better able to advise and aid the sick, in the hour of need. It is, of course, possible that many of these reformers have no children and do not understand.

From the physiological point of view, life is the continual functioning of the organs in the living body, but if for some known or unknown reason one or more of these organs should be removed from the living body, would that body continue to live without the missing organ, or would the body lose its life from the want of the vital activity of the lost organ?

When we look back at primitive man one of the first things he wondered at was the Sun, Moon and Stars in the firmament over his head. Then he wondered what caused the change from darkness of night to dawn of day,—and next he observed that he himself was alive. He walked about and did things and wondered what made him do so. In other words,—What was life? (It was only after man began to gather knowledge, that he asked, What is death?)

Life, or vital phenomena has been a bone of contention since the days of Adam. It has had, we might say, since the beginning of the world, according to Man's belief, two principles,—a natural and a mystical,—some believing in one, some in the other and the rival believers have at-

tempted to explain it, sometimes one theory finding favor and then the other. The followers of Hippocrates found its clearest expression in Galen's system, the doctrine of the Pneuma. The Pneuma was supposed to exist in atmospheric air, to be inhaled into the lungs of Man and thus through the blood to reach all parts of the body, where it produced vital phenomena. Later, in the middle ages the conception of the Pneuma lost its original force, and the mystical powers were looked up to and vital phenomena explained by a supernatural theory. And so it went on, the people believing first one thing then another.

After the establishment of a scientific method in physiology by William Harvey, and the development of Descartes' mechanical system of regarding living bodies, the natural explanation of vital phenomena once more universally found favor. At once two schools arose,—the Iatrophysical and the Iatrochemical. When both of these failed, then by degrees there emerged once more the tendency to explain vital phenomena by mystical means, finding expression in the "Animism" of Stahl. In the second half of the 18th Century, "Vitalism," originating in France, began its victorious march throughout the whole scientific world. Again the opinion of mystical powers was entertained. And so it went on, back and forth until the discovery of the law of "Conservation of Energy," by Robert Mayer. Later its application was applied to the living organism.

Then Frankland, Rubner and others proved that the manifestations of energy by the organism are simply the result of quantity of potential

energy received into the body by the means of food. Finally the stupendous results arrived at by Darwin, the establishment of the fundamental law of "Biogenesis," by Haeckel, prepared the way for a natural explanation of the enigma of evolution and structure of organisms. So today we find that physiology, as the doctrine of life must therefore confine itself to the material vital phenomena of organisms.

The last important step in this direction was made by Schleiden and Schwann, in the discovery that all organisms are built up of elementary living structural components—namely, of cells.

The three general elementary groups of vital phenomena, growth, reproduction and development are therefore in reality merely the expression of the various aspects of one and the same process, of the actual process itself.

The ultimate of all physiology is to discover what this vital process is,—that is to say, what is the exact cause of these manifold vital phenomena, a goal from which we are at the present time still very remote.

As every physical and chemical phenomenon of inorganic nature occurs only under distinct conditions, so vital phenomena are also dependent upon certain conditions of life. Every living body, every living cell requires food, water, oxygen, and further, a certain temperature and a certain pressure in its environment. These are the general conditions of life. But the special conditions on which depends the continued existence of the individual forms of organisms, are as numerous as the forms of organisms themselves.

In the endeavor to study the subject of transplantation of organs no doubt these special conditions are the things that must be considered and studied, for if we wish to transplant an organism it would be well for the transplanter to know if the operation will be successful, or after being transplanted whether the organism will grow, thrive and bear fruit, so to speak. From a surgical standpoint little can be said regarding transplantation of organs except that which is already well known to the medical profession in general, namely, surgical experience, surgical cleanliness, antiseptic and aseptic technic, hygienic environment. In fact all that any surgeon can do in transplantation of an organ is just what he does in every other major operation, where he knows, ninety-nine times out of a hundred, he will be successful, but when an organ becomes atrophied, diseased or injured and an operator replaces it with another organism of its kind, with either an animal or human organism, it is an experiment and he must trust to Providence that all will go well. In the opinion of some it may be a question of vascular anastomosis (the bringing together the ends of blood vessels) or surgical skill, or hygienic aseptic technic, or the general constitution of the patient, or a question of tolerance of tissues.

When we take into consideration the chemical composition of protoplasm or proliferation of cell life in general, it might be found beneficial in cases where transplantation of organs or tissues are made, to take into consideration also the chemical composition of the nourishment administered; also the chemical composition of the water and air.

According to one author, success in transplantation depends on conditions of nutrition and the mass and tenacity of life of the tissue.

In transplantation of organs the material used, no doubt, would be the greatest factor in every case. The operation may be autoplastic (the repair of diseased or injured parts by pieces taken from another part of the body), isoplastic (tissues or organs transferred from one human to another) or heteroplastic (where parts of the lower animals or foreign bodies are used to repair diseased or injured parts in the human). In the transplantation of the thyroid gland we find there has been comparatively great success. Also experiments with the mammary gland and the ovaries, to a certain extent have been successful.

Dr. Carrel has been considered somewhat of a wizard in this field of operation. He has tried many experiments in the transplantation of organs and limbs and has in many cases been more or less successful. In some instances Dr. Carrel, has used fresh material, making the transfer as quickly as possible. He also kept material on ice for hours before using it and both operations were more or less successful, some to a marked degree.

It is also stated that a physiological salt solution maintained at one hundred degrees Fahrenheit, into which the material is placed until used, has been found very beneficial. There has been very little work done in this field of operation, comparatively speaking, therefore a vast record of statistics cannot be referred to in order to obtain a given percentage as to what methods, technic or material is best to use.

Transplantation of organs is as yet in its infancy and work being done along this line might be considered not only from a surgical but also a physiological and zoölogical view. The great benefits to the human family in perfecting work in the transplantation field is readily seen when we consider the examples of physiological Hypertrophy (increased in size) found in many organs of the human anatomy in every day life, in medical practice. Atrophy (decreased in size) of an organ may be from many causes which we will not take time to mention here. There are many kinds of accidents where grafting or transplantation would be of the greatest value. There are toxic actions of bacteria and protozoa, vegetable and animal microörganisms of many kinds which are bent on pathogenic purpose (causing or giving origin to disease), and are in many cases the cause of the removal of an organ from the human body.

When "The Millennium" has arrived, be it the near future or many thousand years hence, will the medical man have accomplished this wonderful feat? Is this operation to be one of the stepping stones to lead us to our goal in the future, making for a happier and healthier race?

For a comprehensive explanation of "organ transplantation" especially the ductless glands of internal secretions and their functions, it will be necessary to give a brief summary of the different branches of the anatomy, each constituting an individual study of the human body. First, the bony skeleton, which at birth is composed of a more or less cartilaginous structure, increasing in density and hardness as the individual grows older. This

foundation acts as a frame-work held in position by the different layers of muscles attached to them and which supply the motive power to move these bones. This branch of the anatomy is known as, Osteology, and may be defined as, the sum of what is known regarding the bones or the study of the bones of the human anatomy, in health and disease. Second, the muscles, divided into two classes known as voluntary and involuntary, meaning those muscles over which the individual has control and those which cannot be controlled. This branch is known as, Myology, defined as, the sum of what is known regarding the muscles or the study of the muscles of the human body, in health and disease. Third, the internal viscera contained in the thoracic and abdominal cavities, this is practically the power house or the machinery composing the organs which manufacture the energy that makes us go. This branch is known as, Splanchology, defined as, the sum of what is known regarding the viscera or the study of the internal organs of the human body, in health and disease. Fourth, the blood vessels which are divided in three separate sections known as arteries, veins and lymphatics. The arteries carry red blood, the veins carry blue blood and the lymphatics carry white blood or lymph. This branch is known as Angiology, defined as, the sum of what is known regarding the blood and lymph vessels or the study of the blood and lymph vessels of the human body, in health and disease. Fifth, the nerve tissues, which make up the brain, the spinal cord and its branches, the nerves, which are the telegraphic system to the brain by way of the

trunk line, the spinal cord. This branch is known as Neurology, defined as, the sum of knowledge regarding the nerves or the study of all nerve tissues in the human body, in health and disease. So we see there are five different divisions to be considered in the general make-up of the body and for convenient study all divisions are again divided and subdivided into many parts. Any of these parts may be attacked from different angles or by different causes which we term, diseases, meaning, not at ease or something going wrong.

The feasible possibilities of success, in the question of transplantation of organisms, by grouping all the tissues of the human anatomy under one head for the purpose of study in any instance whatever, are never advisable. We will therefore select a certain class or part of tissues known as the ductless glands and especially discuss this integral part of the whole, giving emphasis to the important points in this particular part, relating what we know, what we do not know and what has been done in the way of experiments, showing failure and success, as the case may be, and in conclusion what really has been accomplished up to date, in this class or part of organs, but at the same time when necessary, laying stress upon the essential facts pertaining to the relation of these organs to the human body as a whole. It will also be necessary to bear in mind, at all times, that any question of this type and caliber cannot, intelligently, be discussed as a unit by itself, but to the contrary, must be considered in unison with those things necessary to its life, which in this case are biology, physiology, anatomy and pathology.

Of late years, the secondary subject on which we are writing, known as, the ductless glands and their internal secretions, has in a way, been placed in a separate division by themselves, being partly, yet not entirely, excluded from all of the above mentioned studies. This late subject is known as, Endocrinology or study of the internal secretions. These ductless glands seem to be made up of a somewhat different tissue and are of a different complex construction and function. These glands are widely distributed throughout the human body, from the head to the lower part of the trunk. It is an undisputed fact that most of these glands are involved in an essential mechanism of intimate relation, making any one of these glands dependent upon and necessary to the other, by the way of their internal secretions, thrown into the blood stream. The pituitary gland is located in the head, below or at the base and near the center of the brain. The pineal gland is also located in the head, in the tissues of the brain. The thyroid gland and the parathyroid gland are located in the neck, the thyroid in front, the parathyroids behind the thyroid gland, between the head and shoulders. The thymus gland is located in the upper part of the chest. The adrenal glands are located just above each kidney, the pancreas below the liver behind the stomach, the spleen below the diaphragm on the left side, all the last three named, in the abdominal cavity. The above locations are approximately correct and will answer our purpose. No attempt has been made or will be made at any time, to give exact locations and positions, using the full anatomical nomenclature

and detailed scientific description. The late investigators have divided most of these glands into different parts which are called lobes. The gland as a whole may have two or more lobes and the gland as a whole may have one or more functions or each lobe may have its own particular function.

It never has been explained, that is, to the entire satisfaction of everybody, just which one of these glands is of the utmost importance, but it has been admitted by the large majority of all investigators, that all these glands are essential to the welfare of the human economy and concerned in the regulating of health and well being of every human individual, from the day he is born into the world, until the day he dies and leaves it. The product of these ductless glands are called, the internal secretions and which we will see later, are of great significance and influential value, when thrown into the blood stream and thereby carried throughout the body. All these glands are, more or less essentially, very closely related to each other, to the extent, that when one gland meets with any disturbance, in some way this disturbance, which may be from one or more of many causes, has a direct or indirect effect upon one or more of this group of glands, by way of the blood stream. Some authorities claim that when all these glands are normal in size, function and location and work in harmony with each other, this lucky individual cannot help but enjoy good health. These glands are subject to stimulation at certain times under certain conditions, according to some of our well recognized authorities, and when necessary will produce an increased amount or a de-

creased amount of their internal secretions, according to response to this stimulation. Under normal conditions there will be only the normal amount of secretion but if there happens to be an over-production of this secretion, which may happen from many causes, the individual practically becomes poisoned and suffers therefrom and when there is not enough of this secretion or an under-production, the body suffers from want of this internal secretion. In other words when an individual is ill, one or more of these glands is failing to function properly and when an individual dies then one or more of these glands have failed entirely, or one or more of these glands have functioned too great, in either instance the result is fatal, sooner or later.

These glands are sometimes referred to as the endocrine glands. Some authorities say the product of any one of these glands carried by the blood streams to any other gland or most all the other glands of this group, acts as a stimulation in some instances, in other instances it is a process of, inhibition, to one or more of this same group. One author writes as follows, his views and findings several times, having been corroborated by others: "Experiments have shown, the sexual glands inhibit the thymus gland, as well as the pituitary gland. The pituitary gland in turn inhibits the thyroid gland and stimulates the gonads, while the thyroid gland inhibits the adrenal glands. *This tangled skein of cause and effect, of influence and counterinfluence, of stimulation and inhibition, holds within its mesh the great future of the study of medicine.* And unto him to

whom there is given an understanding of the laws of the internal secretions, together with a knowledge of the specific action of the hormones or granules contained therein, unto him, there shall be added all things else." It can be seen, that from the above acknowledged facts, all of which, to a marked degree, have been fully recognized, that the subject is becoming more complicated as we proceed. It is therefore, claimed on facts well founded, that when one of these glands is impaired by disease or otherwise disturbed, there is not the proper mixture or the normal amount of the internal secretion being thrown into the blood stream and thereby carried throughout the body, supplying its several tissues with an essential need; this has a telling effect upon the individual, for it is then that he begins to lose ambition and there may be a general lowered vitality as a consequence, or he may become seriously ill, this illness always terminating fatally in extreme cases, there being little or no help for him.

Several investigators have proven that most of these glands have more than one internal secretion and each secretion has its own particular or peculiar properties, its substance or power or its own particular latent potential energy; that is found manifested in its effort or action, and by virtue of which this substance or power,—supposedly contained in minute bodies which are known by different names, such as, granules, hormones, enzymes or ferments,—produces certain physical changes in the individual, which may be considered from a moral, mental, anatomical and pathological viewpoint. It is quite evident that

these minute bodies bear their message, or act as a messenger secretly, unheard and unseen, bringing hour after hour, month after month, year after year, their glad tidings of good health and great joy, which has not, up to date, been recognized nor appreciated by the world at large. In other instances these messengers bring ill health and dire distress, which may take our beloved ones from us. So it may be seen that much depends upon these minute bodies, even to the extent of life and death. These are the important factors, found in the internal secretions, produced only in the ductless glands and only when the glands are alive and well, and in good health, so to speak, and can perform their normal function. These are facts which are well recognized by all of our best authorities on this subject, who have made a special study of this branch of medicine and surgery.

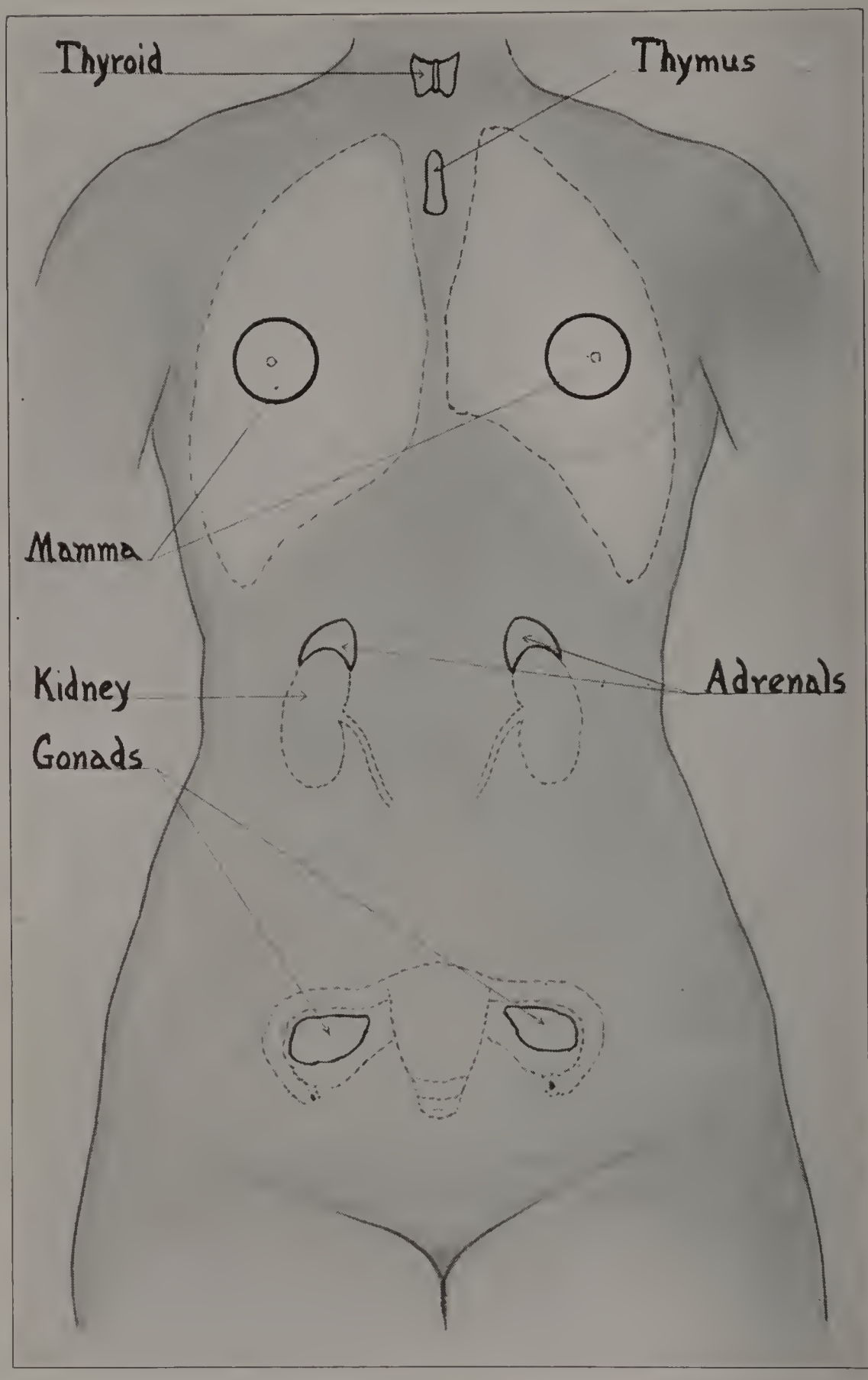


Fig. 3. Schematic drawing showing location of glands of internal secretion (endocrine glands) in the middle and lower part of body in the female.

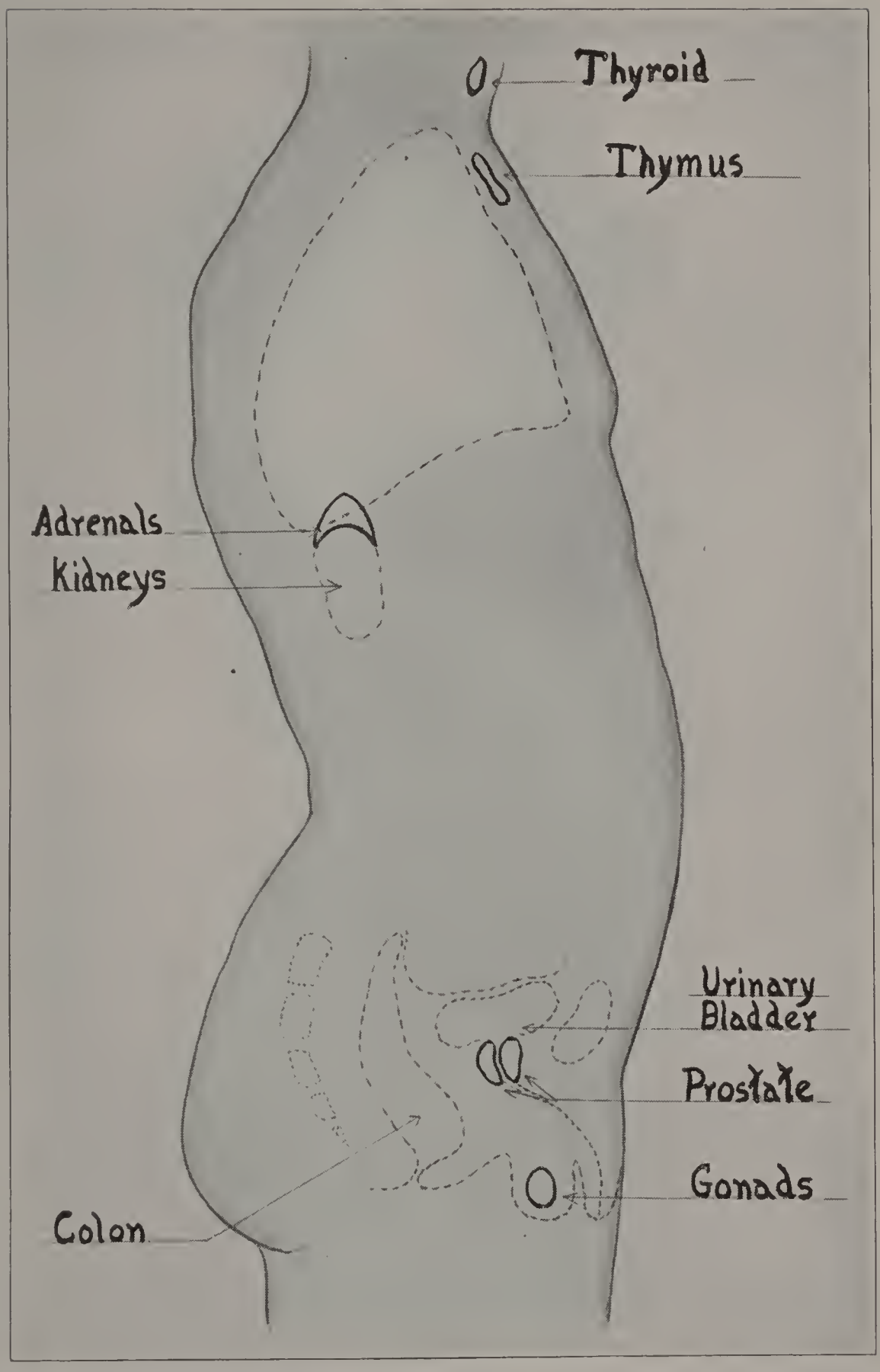


Fig. 4. Schematic drawing showing location of glands of internal secretion (endocrine glands) in the middle and lower part of body in the male.

CHAPTER VIII

OUR VITAL GLANDS

THE thyroid gland is located in the front of the neck in its lower half and consists of two lobes which lie more or less, one on each side of the middle line with a third part called the median isthmus which unites the two lateral lobes. The tissue of this gland is composed mostly of small vesicles, which are small sacks that hold the secretion of this gland produced by the surrounding cells. This secretion is a colloid material in which the supposed physiologically active thyroid constituent, called iodothyrin, is embodied, its principal ingredient resembling iodine. This secretion is carried into the blood-stream by way of the lymphatic channel. In this gland and its internal secretion, we find, as in all others in this group, a conspicuous relation to the blood-stream and the ever present, hormones or granules.

The thyroid gland and its internal secretion is a mass of confusion and a complex problem which cannot be explained in a few words. This gland has a far reaching influence over the entire body, according to its function, which may be normal or abnormal, because it is subject to many disturbances, causing much suffering and no end of trouble in the human family. It has lately been agreed and accepted by most authorities, that the internal secretion of the thyroid gland exerts an important influence upon general metabolism and

nutrition. The secretion of this gland, in a general way, is an important factor in the destruction or neutralization of toxic wastes, foreign material, bacteria and their harmful products. There are differences of opinions as to precisely how this secretion brings about its influence or action. After extended study of several thousand cases of disturbance of the thyroid gland, there was doubt as to the cause of the trouble, which may have been, perverted function, altered rate of normal function or infection.

The thyroid gland is called by one writer, "The Keystone of the Endocrine Arch," and he claims that it most certainly plays a very important part in the symptom-complex of pernicious anemia, which is a disease of the blood-stream proper, which may be the result of many causes, principally, any bacterial infection; others claim the adrenal glands have something to do with this condition, since adrenal insufficiency is a very common occurrence in pernicious anemia. The most common disease of the thyroid gland is known as goiter, or enlargement of the thyroid gland. The condition or disease has many names and alterations, depending upon the case. When there is a lowered function of the thyroid gland with a consequently lessened internal secretion from this gland, in extreme cases, there develops a condition or disease, known as myxedema which occurs in adult life. This condition generally occurs where the thyroid gland shows a distinct atrophy or a reduction in size, but there are cases on record where this disease was present, in which the thyroid gland showed a marked increase in size at

first, atrophy following gradually. In children where there is a decrease in the internal secretion of the thyroid gland there develops a condition known as, infantile myxedema or cretinism and occurring as it does before the body growth is complete, we find as a result, there is a marked retarded mentality and a general physical backwardness, the sexual development is practically at a stand still; the child does not grow up, but takes on the appearance of a dwarf, and with the mental and physical stigmata makes a pitiable picture, which one does not care to look upon. Where there is an excessive amount of the internal secretion thrown into the system, by an overactivity of the thyroid gland, as a rule, there is increased heart beat and rapid loss of weight, with many other symptoms, terminating in convulsions and death, in severe cases.

Experiments with animals have shown, that when the animal has been fed extracts of the thyroid gland it has a marked resistance to all infection and to poisoning by organic matter, while those animals whose thyroid gland had been removed, fell easy victims to infections and poisoning by chemicals. Some claim, that experiments have shown that the hormone in the internal secretion of the thyroid gland stimulates and supports the gonads and without this stimulation and support there is a marked sexual deficiency. Most authorities agree, that where there is trouble with the gonads the thyroid is always involved, more so in the female than the male of the human. Also, whenever there is any disturbance of the thyroid gland, there will always be found its influence on

the function of the gonads. Removal of the thyroid gland in its entirety does not necessarily cause death at the time of removal, but may later cause impaired general nutrition, loss of weight, with marked changes in the blood stream, all of which eventually cause death, due to the lack of the internal secretion of the thyroid gland.

One author says, "the foundation for the theory that old age comes on or that youth is lost as a result of changes in the thyroid gland, lies in the fact, that in old age the thyroid becomes atrophied, its follicles shrink and retrogressive changes take place in the epithelial cells." On the other hand, another author states that he is inclined to think, that old age has more to do with deficiency of the function of the adrenal glands. The truth, perhaps, lies in the fact that in old age all the ductless glands are undergoing atrophic changes, which may account for the general symptoms of senility. The same conditions prevail, no doubt, in the symptoms of senility in the middle aged. The more the medical profession study the thyroid gland and its internal secretion, including its hormones, it seems, the more they must study it, if we would learn its full significance. This is due to the fact, that new light on this subject is being brought forward every year, explaining new phenomena in its action. Some day we may conquer it, especially its specific function in relation to its associates, the other ductless glands, their internal secretions and hormones.

The adrenal glands, sometimes called the suprarenal bodies, are each composed of two portions or lobes, called the cortex and medulla.

These glands are located in the abdominal cavity just above the kidneys, there being two in number, one mounted, apparently on each kidney but having no direct connection with the kidney. It is a known fact that during fetal life (during the stage of development before the child is born into the outer world) the adrenal glands are much larger than the kidneys, that at birth they are about equal in size, and that a process of involution is immediately inaugurated, which slowly brings about old age. According to our late authors, the cells of these glands contain small granules which, when sufficiently dense, diffuse out of the cells into the adjoining small blood vessels, and appear in the small adrenal veins as a yellowish brown, mucoid material; this is the internal secretions which pass from the small into the large veins, then to the heart and into the general circulation. Once more we find two seemingly essential factors in the make-up of these glands which are, numerous blood vessels and the granules.

Some of the scientific investigators collecting evidence relative to the function of the adrenal glands say the adrenals give to the human being all the courage and ambition which is required in any crisis or wherever a special effort is needed in extreme exertion. Also, that any impairment of function of the adrenal glands, such as, tumor formation, atrophy or disease, would undoubtedly cause old age, while on the other hand, the integrity of the adrenal glands plays an important part in the promotion of longevity. One author writes as follows: "There are direct nerve-paths connecting the adrenal and pituitary glands, this is a

sort of line of communication and these glands telegraph their wants to each other." Experiments in animals showed that small doses of the extract of the adrenal gland will stimulate the thyroid gland to activity and increase its secretion. Many authors claim, it has been a long recognized fact, that the adrenal cortex of the gland is capable of exerting a marked stimulating influence on the essential organs of reproduction, by way of the blood stream.

The most important and common disease known to affect the adrenal glands are infections, principally tuberculosis, and tumor formation, principally the true cancer type; in either case this is known as Addison's disease, which as a rule, in all instances, terminates fatally. Any rapidly developing disease, causing destruction of the adrenal glands or the removal of both of these glands in man or the lower animals, causes early death. Also where there are any chronic progressive changes, causing slow destruction of these glands, it always terminates in coma and sudden death, due to the lack of the product of this gland; its internal secretion. Where there is an over-production on the part of this gland, there is an excessive amount of the internal secretion sent into the blood stream, resulting in a general premature development as the most prominent symptom. Therefore, when we see children thus afflicted, they appear to become rapidly grown-ups, not only in size, but in sexual development as well. Hence, a child of seven years may look like an individual twenty years of age. Any tumor formation on the part of this gland may cause a child of five to

appear ten or fifteen years of age. It is a known fact, among the medical profession, when the adrenal glands are affected, those individuals must use marked caution in sexual matters; any over-indulgence may be very detrimental to the general health.

The pituitary gland, sometimes called the pituitary body or the hypothysis cerebri, is composed of three separate and distinct parts or lobes. It is located in the median line and about the center, in the base of the brain, just above the base of the skull on a bony prominence, called the sella turcica, meaning a Turkish saddle which this structure resembles, the gland apparently riding in the saddle. In this gland we again find its construction mostly made up of the blood vessels and secretory cells which produce a colloid material containing granules; this is known as the internal secretion of this gland. Again we find a strong contention that the blood stream is considered as the real channel for the distribution of the pituitary granules or hormones. All late investigators have come into agreement to the effect that this organ is essential to life, its complete destruction or removal causing death. It has been said by some authorities, that this gland acts as a governing center of the adrenal and thyroid glands. An over-production or secretion from the pituitary gland will produce a disease in the human, in childhood, known as gigantism or the excessive growth in the skeletal bones. This may be regarded as the prodromic syndrome or the primary stage of a disease found in adult life, from the same or different causes, and known as acro-

megaly. Some authors claim that gigantism and acromegaly are two separate and entirely different diseases and caused under different conditions, involving the pituitary in either case.

Where there is a decrease in function of this gland causing a deficiency in its secretion, there is always the reverse in type of the individual, more or less marked. In childhood we find infantilism and dwarfism usually with obesity, while in youth under development of the gonads in both male and female. In the adult male there is a tendency to acquire feminine characteristics, such as, altered distribution of hair and fat, large breast and change of voice, in the adult female there is a more or less masculine or a mannish appearance, with change in some way of the monthly function. In both male and female there are other marked symptoms, including lack of ambition and lowered sexual activity. All the above signs, symptoms and conditions, and many more, are caused from the fact that the human system or body is suffering from the want of, or lack of the internal secretion of the pituitary gland.

Confirmation of the especially prominent influence of this gland on the essential organs of reproduction has been brought to light by the following experiments on animals, which have shown: When a small portion of the gland is removed in the young, there is a characteristic state of sexual infantilism, while in adults there is incomplete or defective structure of the generative organs. The feeding of extracts of this gland to the young produced premature maturity and functional activity of the reproductive organs. The

animals bred earlier and oftener when fed this extract, the effects lasting throughout the adult life of these animals, as compared with those animals which had not been fed the extract and which were used as a control. Some authorities have found by experiments on animals that feeding the extract of the pituitary gland caused excessive structural and functional development of the sexual organs. Other animal experimentalists have found that incomplete removal of the pituitary gland in many instances results in genital atrophy, while some authorities have proven that complete removal of the pituitary gland is always fatal. It may also be added, that in nearly every case of disease of the pituitary gland and where examination of the pituitary gland has been practicable—before or after death—there was always found evidence of tumor formation, in many instances of the true cancer type. In one report on record, of twenty-nine cases of tumor formations of the pituitary gland, there were twenty-three of these tumors true cancer, more than ninety per cent, cancer. There is little or no evidence on record where any disease except tumor formation, has affected the pituitary gland.

The organ known as the pineal gland, sometimes called the pineal body, so named from its shape which resembles the pine cone, is located in the brain tissue and has had a varied career. Descartes thought it contained the soul. The pineal gland is supposed to constitute what remains of a special visual organ, called by some the pineal eye, in certain invertebrates and low vertebrates, especially the reptilia. In the higher vertebrates, nearly

all the structural peculiarities of a definite sense organ have been lost, and the main histological features (the microscopic study of the anatomy) are those of a gland. Of late years this gland has been raised to the rank of a useful organ in the human being. Again we find the important granules and many blood vessels which make up the greater part of this organ. Some claim that this gland has something to do with the control of the growth, activity, intelligence and development of the gonads in the human. There have been many contradictory reports, however, to emphasize the fact that little is known concerning the actual functions of the pineal gland. Some authorities, after much investigation, make the assertion, that the pineal gland is not necessary to the human economy. Others declare this gland cannot be considered as an organ of internal secretion and that at the present time our knowledge of the function of this gland is more problematical than accurate, also that the experimental observation upon the lower animals leaves us without any reasonable hypothesis which may be remotely related to the pineal gland function.

By experiments in feeding with pineal gland, animals showed more rapid growth of the body uniformly and an early sexual maturity. Strange to say, that during the experiments, when once the animals attained their natural size the gland feeding seemed ineffective in producing further results and no sign or tendency to gigantism was noticed. The small amount of one-third of a grain, given once a week proved sufficient to stimulate growth beyond the usual or natural rate. The reproduc-

tive organs of the male animals showed a fifty per cent increase in size and activity, also a more rapid rate of reproduction, other animals being used as a control and not fed the gland. There is little or no evidence on record of any disease of the pineal gland, except tumor formation of different types.

It should be stated now, that any tumor formation is sometimes called neoplasm, which means, new growth. Under the heading of tumor formation or neoplasm there are many types of tumors. Two of the principal types of these tumors are carcinoma and sarcoma; either one of these two tumors is known to the laity as cancer, which is so commonly found in the human being. One case of pineal tumor,—found in the human,—verified by autopsy, and reported in one of the medical journals, showed that there was an extreme precocious sexual development state, appearing more or less suddenly with a certain amount of adiposity. There are on record, forty-seven cases of pineal tumor formation, fifteen were sarcoma and four were carcinoma, which are the two principal types of cancer, making a total of nineteen cases of true cancer in forty-seven cases. When we consider that almost every case of pineal gland disturbance is caused by tumor formation, which means that apparently only tumors affect the pineal gland, and then remember that cancer is a type of tumor, together with the fact that nearly fifty per cent of tumors of the pineal gland were cancer, also that ninety per cent of tumors found in the pituitary gland were cancer, and then bear in mind the possibilities of influence of the pineal and the pitui-

tary gland upon the gonads, it should make an individual think twice, before undergoing an operation for interstitial gland transplantation.

With our meager knowledge on the subject there is enough evidence to warrant a warning, that there are grave possibilities attending the risk of an interstitial gland transplantation operation, at least until we learn more facts as to what may or may not happen and even then it would be well to have the percentage of good points in our favor, before having the operation done. The last statement above, without other knowledge, from the standpoint of biological, physiological, pathological and anatomical facts, is not very elucidative, however, it is worthy of some consideration.

As we read, we cannot help but notice the infringement at all times, of any one function of these glands upon the others, insistently and constantly. It almost amounts to an intrigue in a measure, as if these glands with their secret methods were some clandestine group, wherein there were some rebels, at one time all working together in harmony and at another time fighting each other, at times one gland invading the domain of the other fighting it alone, while another runs amuck attacking the entire group with an overwhelming amount of secretion, at another time one gland will refuse to function at all, as if in protest for some reason or other, against all the other glands. When viewed from another standpoint, it may be said, that there is much evidence to prove, that none of these glands are entirely independent of the others at any time during the life of the individual, but on the contrary, each gland

is dependent in some way upon all the others or at least some of its fellows for some assistance for its vital existence by the way of the blood stream and apparently when one gland suffers, regardless of the cause, all glands in the group feel the effects, more or less, with the result that all glands in the group suffer, more or less as the case may be.

The parathyroid glands are generally four in number, there may be more, there may be less. They are about the size of a pea having the appearance of an oval disk and located, as said before, in the neck behind the thyroid gland and in front of the "posterior" muscles. (All of these muscles "posterior" which are attached, more or less, to the ligamentum nuchae and which is said to be in man, merely a rudiment of a once important elastic band and fibrous membrane,—which, in some of the lower animals, especially the quadrupeds or four-footed mammals, serves to sustain the weight of the head,—is perhaps another point in favor of the Darwin theory.) It can be seen that these glands are well protected because it has been proven that these glands are very necessary to life and when removed in their entirety death soon follows. We have very little knowledge of these glands as they give us very little trouble because they are very rarely affected by disease. There are only two important facts found on record, one is that at times the parathyroid glands may be so closely connected with the thyroid gland, that should these glands be removed in such cases by mistake, when operation for removal of the thyroid gland is done,

it ends fatally; the other is that there are several cases on record of tumor formation of the parathyroid glands, some of them of the cancer type. The physiology and function of the parathyroids is still disputed, some claim these glands have a specific and independent function, others say it is doubtful, no substantial proof having so far come to light. In the literature we find that these glands would seem to furnish to the blood path a hormone which renders innocuous or tends to neutralize, any poison that may exist in the body. This is a special function which is called the detoxicating function.

The thymus gland is sometimes called a temporary organism growing to full size in the second year of life in the human, then it ceases to grow and remains practically stationary until the age of puberty, at which time it rapidly degenerates, or undergoes a process of retrogressive change, but does not entirely disappear. When this gland is full grown it is found to extend from the lower part of the neck down over the lungs in the chest, and is about three inches long, two inches wide, one-half inch in thickness. It is of pinkish-gray color, lobulated surface and of soft consistency. At birth it weighs about half an ounce. From the beginning of life, until the individual, male or female, is twelve or fifteen years of age, the thymus gland seems to dominate the situation and there are little or no developments of sexual characteristics. Then the gonads of both sex seem to declare themselves and demand their rights and the change from the child to man or woman begins to take place. The action of other glands during

this change is disputed or unknown. When once the man or woman has been firmly established the thymus gland seems to have served its purpose because it then seems to atrophy and almost disappear. Since the year 1853 it has been known that there is a distinct relationship between the thymus gland and the gonads of the male. The physiology and function is said to be that the thymus supplies, through the agency of its lymphocytes (white blood cells) an excess of phosphorus in organic combination (through the process of metabolism), which the body, particularly the osseous, nervous, and genital system, requires during its development and growth. It is claimed also that the secretions from this gland take an important part in the autoprotective functions of the body, in conjunction with other glands. There are cases of tumors, syphilis, tuberculosis and other infections of this gland on record. There is a special condition known as "status thymicolymphaticus" being an enlargement of the thymus gland and which has caused death in children and young people; this is known as "thymus death," with heart failure.

The gonads or interstitial glands of the human being in the male differ very much in their location, structure and function, from that of the female. The location of these glands in the female is one which affords every protection to these glands, from all ordinary external injury. Nature seems to have placed all our vital glands in a position or location where they are naturally well protected or where they can easily be protected by the individual. In the location of the gonads of the male of the human, however, there is one

instance where nature has apparently failed in her purpose, but if we accept the Darwin theory of evolution, nature did not make any mistake even in this instance, because any one can readily see and understand, how the gonads of all quadrupeds are very well protected. This apparent failure then, on the part of nature, in the male, is due to the evolution and civilization of man; possibly this is also a point in the favor of the Darwin theory. As far back in history as 1849 experiments showed, on removal of the gonads of a young rooster, the characteristic developmental changes in his voice, and his fighting spirit and comb were missing. It has many times been proven, since that time, that when the gonads of the young male fowl have been removed before it is old enough to develop a crow, this rooster will never crow. The fowl is then called a capon, and it is said this procedure will improve the flesh and growth of the fowl, at the same time it may be a demonstration of the claim, that the interstitial gland transplantation operation will bring a change of voice or vocal organs. The question here arises, Is the change of voice or vocal organs caused directly by the removal of the gonads, or indirectly from the loss of the internal secretions given into the system by the glands that were removed, it being possible that the product of the gonads when thrown into the blood stream and thereby carried to other glands would have some action on these other glands and produce the crow or change in voice? This question may some day be answered. It is to be remembered that the gonads of the male and female in the human, are not, anatomically, ductless glands, but in

addition to their reproductive usefulness, it is an unquestioned fact that they do produce an internal secretion, which is correlated with the hormones of the true ductless glands in maintaining the physio-chemical balance of the human body. About thirty years ago, there was published in a medical journal in France, a treatise dealing with research, on interstitial gland organotherapy. There it was stated, a man offered himself as a subject and had injected into his body, a preparation prepared from the gonads of the dog. He reported that almost instantly he was endowed with renewed vigor and virility but the effect soon disappeared. The charlatans of Paris commercialized this fact by promptly seizing the announcement. As a result the real significance of the facts were lost in the effect of unethical practitioners to secure large sums of money from susceptible patients. One fact stands out clear in this case, it was not an operation of gland transplantation, but a preparation of the gonads, which was introduced into the body, which no doubt, when carried in the blood stream to other glands, acted as a stimulation to these other glands in the body of this man, hence, the apparent rejuvenation, for a time, while the stimulant was effective. It is also necessary to consider the possibilities of the psychosis or psychophysiology in these cases of experiments, that we may learn the exact benefits, if any, and to what extent good results, of a substantial, permanent and truly material character may be obtained; in other words, there is a possibility of a mental phase in these experimental instances.

It is hardly within the power of the family physician or any clinician to be able to go deeply into all factors in all cases as they pass by in the rush of a day's work, but it would seem that in addition to the objective clinical pictures, there should be made as far as possible, an analysis of the personality, an investigation into social and environmental activities, a study of the instinctive demands, and a determination of the level of the emotional threshold which would be helpful in the treatment of so many of these qualitative and pre-quantitative endocrine disorders, especially those in which the nervous symptoms predominate, and which, unfortunately, heretofore, have received such limited attention. In truth, success will always attend those efforts which go beyond the ordinary methods of procedure, and it will surely be an advantage to him whose conception is big and broad enough to comprehend these disorders in the fullest possible aspect. It is a fact that cannot reasonably be denied that nearly all neurotic conditions are, more or less commonly associated with various ductless gland disturbances. It has also been noticed that certain cases of mental involvement, having a tendency towards insanity which may have terminated as temporary or permanent insanity cases, have been aided, while others have fully recovered, by organotherapy.

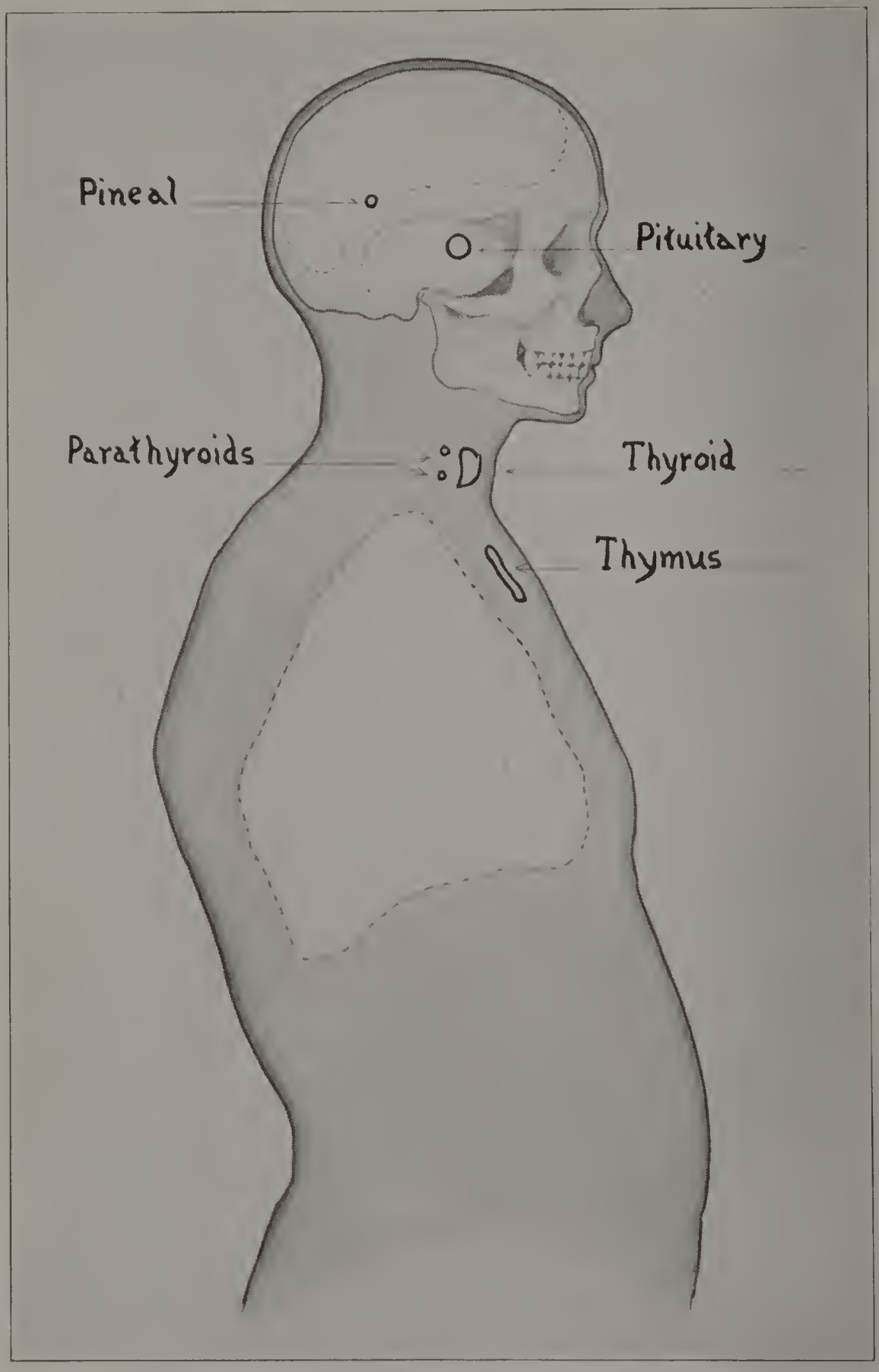


Fig. 5. Schematic drawing showing location of glands of internal secretion (endocrine glands) in upper part of body in both male and female.

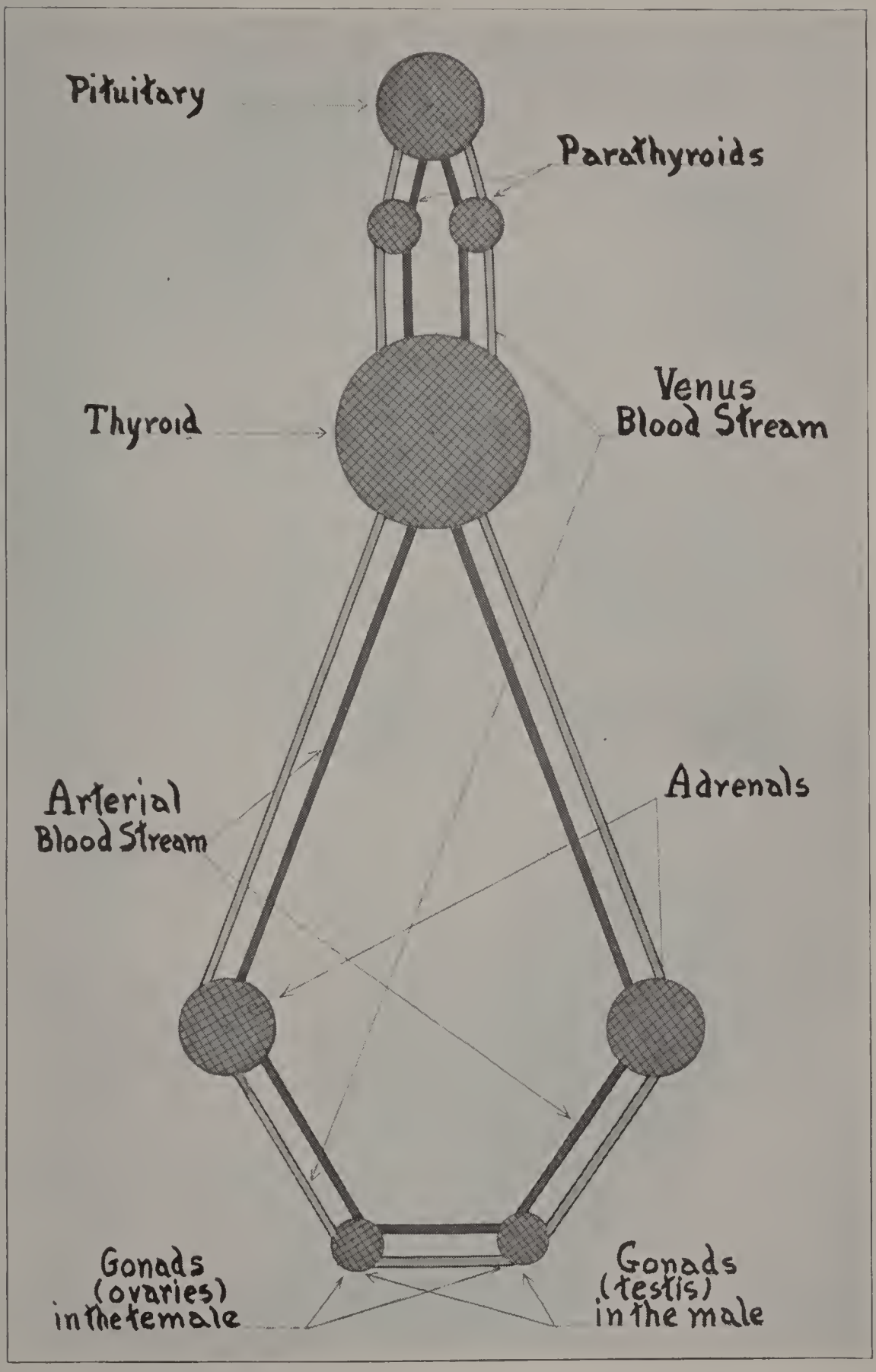


Fig. 6. Schematic drawing showing some of the important glands of internal secretion (endocrine glands) as directly connected by the blood stream in both male and female in the human.

CHAPTER IX

INFERENTIAL JUDGMENT

NOWHERE, at any time, has there been any attempt of explanation, to the public, relative to the gross amount of complications and implications of the ductless gland organs in the human body, all of which play an important part in the so-called, interstitial gland transplantation operation. The wide distribution and location of these organs or glands throughout the body makes the discussion of this subject all the more complicated and confusing. It makes all scientific investigators and the medical profession, more or less skeptical in their views regarding the precise function and exact importance of contribution to life itself, from these glands, directly or indirectly, also in health and disease of the human body. Arthur Keith, lately, in his presidential address before the "British Association for the Advancement of Science," concluded, "that bodily and mental features which mark the various races of all mankind are best explained by the statement that the conformation of every vertebrate animal is determined by a common growth controlling mechanism which is resident in a system of complex glandular organs, known as, the pituitary, pineal, thyroid, adrenal and interstitial glands, with the pituitary gland as one of the principal pinions in the machinery." So it may be readily seen that of late years these glands have been set apart from all other parts

of the human anatomy, in a class by themselves for the purpose of study, in conjunction with the other parts of the body, in health and disease.

After summing up all the evidence which has been produced and brought to light up to date, regarding transplantation of organs or glands, from a practical and scientific point of view, it is noticed that there is not a single case on record where it has been proven that any gland transplantation operation would be a success before the operation was done, nor is there a single case on record where it has been proven that an interstitial gland transplantation operation was truly a success. This statement is based on the following reasons: When the prospective patient asks the physician before the operation, "Will the operation help me or will it be a success," the physician, if he tells the truth, must say, "I do not know." Why must the physician or surgeon say, "I do not know"? Because it has not yet been definitely proven, just what are the essential factors or requirements necessary to make this operation a success, first on the part of the prospective patient and second on the part of the best material to be used in the transplant. In other words, there is not at the present time, any practical or scientific test known, or at least such a test has not been brought to light, up to date, if known, where a test can be made on the prospective patient, or on the expectant donor of the material to be used, or on the material itself, which will serve to give the operators any information whatever as to the relative success of the operation in any given

case. These are the things we must learn in the near or far future. The measure of duration is absolute. Time alone is responsible for the slow but sure change in all things, so, by degrees, the magnitude of this problem will slowly come to be known to man.

This can be all the more appreciated and more easily comprehended when we recall the vast number of failures in the past years, when the operation for blood transfusion first came in vogue. Today the medical man can test his patient and the donor before the operation in any given case where a blood transfusion is necessary and the physician can assure his patient the relative success and therefore benefits, which the patient may expect. By this test, the possibilities of injury to the patient or of placing the life of the patient in jeopardy, by using the blood of a donor whose blood would be incompatible and antagonistic to the blood of the patient, is eliminated. All this may be ascertained before the operation takes place, in blood transfusion, by selecting the proper donor. To use the blood of any Tom, Dick or Harry, which may happen along will not do, the result may be injurious, perhaps fatal. Therefore, the blood of the donor must be tested and selected in every individual case. It is as important as selecting the food we eat; some is good and nutritious and some is bad and poisonous.

As the compatibility and incompatibility, sometimes called tolerance or intolerance, of one individual's tissues for the tissues of another individual, no doubt plays an important part in every case of gland transplantation, this point will some

day be given much consideration. There will perhaps be a test worked out for the patient, and for the donor of the material to be used. This would give us one more point in our favor as to determining the relative or complete success of a transplantation operation in the expectant patient, in addition to the type of blood test.

Gland transplantation, at least in the human being, as practised today, is considered a failure from all points of view and should not be done until we have more knowledge on the subject. In support of this contention the following facts are shown: First, that a certain set of organs are in a class by themselves, each of them closely related and dependent on the other by way of the blood stream and nerve connections. Second, because of the definitely known process of stimulation and inhibition by the different methods, of one gland in relation to one or more of its fellows in this group. Third, the function of these glands is to produce a substance known as the internal secretions and that both gland and internal secretions are of vital importance to sustain life in a normal and healthy condition at all times. Fourth, beyond all doubt, the internal secretions of these glands contain in every instance one or more of its own specific factors, known as hormones which are live minute bodies, very powerful in their hidden process of energy, constructive in health or destructive in disease, as the case may be. Fifth, these glands can only perform their function of producing this internal secretion containing these hormones, when they are alive and normal, being properly connected with the blood stream and the

nerve supply. Sixth, it is known that the extracts of these glands in the dry or solution form, when properly administered under necessary conditions and circumstances, will produce wonderful results in the practice of medicine. When the dose is too small it is useless, when too large it is dangerous and may be fatal, acting just as an overdose of any drug or a dose of poison.

The full significance of the life saving and death dealing powers of these internal secretions or the hormones contained therein, may be appreciated in a more comprehensive light, when two or three of the many illustrations are given, of what secreting glands in the animal body can do. We have many instances of toxin production in disease, one in particular worthy of mention in a disease commonly known as lock-jaw or tetanus; a toxin in this disease is produced by the tetanus bacillus, which, by tests, has been found to be more deadly than the venom of the American rattlesnake. There are many insects, reptiles and lower animals who have the faculty of secreting and storing up in their bodies a deadly poison. It is also a strange fact that these animals, reptiles and insects carry in their bodies these deadly poisons without harm to themselves, but with the ways and means to use these toxins with deadly effect in self-defense. Perhaps, without our knowledge the human being also carries a gland which secretes a certain poison, without injury to ourselves, but to be used with deadly effect in combating our greatest enemy, all bacterial disease, such as tuberculosis, syphilis, typhoid, tetanus and many more. It is logical to assume that this de-

toxicating power in the human is an established fact for the reason that many cases of lock-jaw (tetanus) do recover and get well, if it were otherwise every case of lock-jaw would necessarily be fatal. This same theory holds true in many other diseases.

The Indian Mongoos is able to kill venomous reptiles with safety to itself. This is no doubt due to the fact that the Mongoos possesses a gland which produces an internal secretion containing a hormone thrown into the blood stream, which will neutralize the venom of the reptile, when this animal is attacked. The Indian Mongoos is especially serviceable in India as a serpent-killer and seems to enjoy an immunity from the venomous reptiles unless repeatedly bitten. The American pig is said to be able to kill an American rattlesnake and eat it, without harm to itself; it has been proven that certain chemical poisons can be fed by the pound to the American pig without harmful effects on the animal. It is of great significance to note that these deadly poisons do little or no harm except when introduced directly into the blood circulation, when it is nearly always fatal. These are a few of the thousands of proofs that there is surely something confounding and confusing in the complex duplicity of the ductless gland, producing a secretion, containing a something, thrown into the blood stream of all the higher and lower animals. This something surely has an infinite potential capacity, which when called into action, will serve in a dual capacity which may be detrimental or beneficial to the animal life as requirements demand. Legend has

for ages linked our tree of all knowledge to the serpent, especially the secret pertaining to life and death. Now, strange to say, we find the venom of the serpent a possible factor or a link in the chain of chains of our present knowledge which may prove to be in years to come a revelation. This continual welding together year after year for many centuries the knowledge explaining the factors, pertaining to and disclosing the truth, as to what makes life and what causes death, may contain herein the answer to the eternal question: What is life and what is death?

Some radical changes must be made in the art of surgery, if we would be successful in the transplantation of organs or glands. This is self-evident. The fundamental principle of surgery as it is today, its technique and instruments are apparently not to be used, it being quite evident that there must come a day when these methods will necessarily be revolutionized, eventually evolving into those methods with which we may meet the actual requirements in this field of work. When and how this revolutionary procedure will occur we will not attempt to say. In the act of transplanting a gland, using our method of today, it must first be removed from its original owner. This procedure is not successful because it is necessary to cut many structures connected with the glands, arteries, veins and nerves. We now have removed the blood supply to the gland proper and it cannot be repaired, hence the gland being deprived of its vital nourishment dies and its power of secretion is gone forever. The gland now as a dead body is transplanted into its new and

strange environment, the entire system and nature of the recipient rebels against the new intruder and treats it as it should, according to all nature's laws; a foreign body invading a private domain. The battle of antagonism is begun. The gland is at once attacked and surrounded by a white fibrous connective tissue process, the gland now becomes a walled off object under pressure. From the very moment the gland found its new resting place, the surrounding tissues—whose functions are to destroy, if possible, all foreign bodies,—begin to conflict, their intentions and duty being, by penetration, dissemination and assimilation to dispose of this gland, looking upon it as an enemy. This is nature's attempt to heal and protect every individual from harm and injury, and will occur in any and every instance, in any part of the human anatomy, more or less. If this circumstance were not true, the days of the human family would surely be numbered. In the particular case of the gland transplantation operation, this same circumstance will prevail and nature itself, or nature's laws, innocently and unknowingly, destroys our good intentions, thereby defeating us in our purpose, while it is always nature's intention to do good. The result is, in a short time we find nothing remains of the transplanted gland but a hard, shrunken, perverted mass, absolutely useless. The situation of the gland when transplanted may be favorably compared with a bullet, buckshot, small piece of metal, wood or any foreign body which many people carry around with them, in their every-day life, in different parts of their body as a result of accidental injuries. These foreign

bodies, for some reason or another were never removed, but were attacked like the gland and surrounded by a semi-cartilaginous connective tissue-mass and not being able to destroy it, nature was content to hold it securely as a prisoner. The transplanted gland once surrounded by this wall of connective tissue process is cut off from the blood stream and could not possibly perform its function, even though it were not dead, and should like to function. There are many old soldiers, whom you will meet and who will say to you, "Feel that lump in the muscle of my leg, well, that is a bullet and it has been there for years, but it never annoys me, so I pay no attention to it." Nature has surrounded it with a connective tissue process. Connective tissue has only one function and that is, to form a so-called scar.

It can now be plainly seen—therefore, truthfully and honestly said, without any hesitation or fear of contradiction—that the interstitial gland transplantation operation, as it is done today is only an experiment and has all the ear-marks of a hocus-pocus and a bunkum-bunko game, only done for mercenary reasons. In justification of the above statement, it should be well to remember that we never hear of this interstitial gland operation being done by such men as the Drs. William or Charles Mayo or any other of the recognized surgeons in the United States. This is no doubt due to the fact that these surgeons who have made their reputations by doing good work, do not care to have their names placed on the same categorical plane with charlatans, clairvoyants and gypsy fortune-tellers who will read the cards, your palm,

or gaze into the crystal and then tell your past, present or future for fifty cents.

There are many reasons why this operation should not be done, first because of the post-operative dangers entailed in any major operation, such as, pneumonia, infection of the wound and surgical shock, any of which may prove fatal. Any good surgeon will admit that there is always some risk, even in the best prospective cases. Then there are the possibilities of what may happen, as we know so little about the transplantation operation and therefore, cannot afford to overlook or omit such possibilities and even probabilities as, tumor formation including cancer, also, syphilis or tuberculosis resulting from tissues used in the transplant, because it is always a question as to such material used (be it human or lower animal tissues) being entirely and positively free from these two well known infectious diseases.

The argument that one of these transplantation operations has been successful now and then has never been proven to be true. There has never been any absolute proof brought to light to show when and how the operation was a real success. In every case there is always that veil of secrecy thrown about the operation, always the new discovery some surgeon has made in the method used or the new technique they say and refuse to say more, or a new kind of material is to be used in the transplant, there is always that mysterious and superiority of knowledge attitude. All this makes a fine cloak to hide behind, giving the operator a chance to get the money while practicing this type of quackery. We say, "this type of quackery"

because there are many kinds of quackery, and quackery is defined as: "ignorant or fraudulent or unfounded pretentions, in medical practice." It is quite clear that any one who will do this operation is either ignorant, or a fraud, or the pretentions are unfounded, except in those instances where the operator made it plain to the expectant patient, that the operation is only an experiment and any beneficial results are problematical; under all other circumstances there are great possibilities of evident grounds for suit for malpractice; unless new light is thrown upon the present day methods, both practically and scientifically. There are many methods of deception which may be used, intentional and unintentional, depending upon the ignorance or knowledge of the operator, on the subject, and especially in the case where there is a large fee involved as an inducement to perform the operation. This does not include those investigators who do "experiments" and who seek the "truth."

CHAPTER X

PERSONALITY

IF consciousness be set on one side as over against reality, and merely holding up a mirror to it;—then it follows with naturalness that the truly real must be something which lurks unseen behind the subject's representation of it. Hence come the different varieties of a so-called phenomenalism. It is said that anything phenomenal is something visible or directly observable, as an appearance, an action, or any unusual occurrence; an inexplicable fact or something so extraordinary as to excite wonder or admiration; as a person or thing of remarkable qualities or powers. The above can be appreciated when reading the statement which follows; for many years research workers have studied what are known as, the internal secretions, found in the human being and in the lower animals. These internal secretions are said to contain minute bodies of ultramicroscopic existence. The research work of late years, which has been done relative to these minute bodies, has shown that it is quite possible and very probable that these minute bodies are the all-important factors involving the producing of a human being, who is known in life as, a wonder, marvel or phenomenon. It is also a grave possibility that future research work may prove that these same minute bodies are responsible, directly or indirectly for the production of the other extreme of the human

being in life, the so-called monstrosity of human nature.

We will be well repaid if we review for a few moments these two extreme forms of nature's production. In either case it is, apparently, only a slight or a gross negligence—as the case may be,—on the part of nature or the result of an unknown infringement on the natural law of propagation. The only excuse offered today, in the case of the handsome man or the beautiful woman, in face or figure, is that nature did her work very well in producing the phenomenon; but in the case of the ugly looking person, in face or in figure or both, which may be to the extent of repulsiveness, nature refused or neglected to finish her work, sometimes so much so, as to go to the extreme of producing the monstrosity.

When nature does produce a phenomenon in the male, we find as a rule, the physique of the athlete with handsome face and symmetrical form, denoting a general picture of good health and in most instances accompanied by a remarkable intellect and adept disposition, a ringing laugh melodic and pleasing to the ear, a voice clear in tone and enunciation, full of meaning and expression; all of the other special senses acting in coördination and harmony, with a pleasant happiness emanating from his whole being. In the case of the production of the phenomenon in the female all the above hold true, but from the standpoint of true femininity, including all the virtues which make the beautiful woman, the exceptional wife and ideal mother.

There are, of course, the two extremes in

nature's production of the human being, or the so-called "positive" and "negative" phase of humanity;—as viewed from the standpoint of personality or phenomenalism, or, the "positive" phase, signifying the possession of those qualifications which give to an individual the so-called personality or individuality; while the "negative" phase tends to explain the absence of the "positive," or those exemplary and much desired characteristics—there are the many types of individuals in between these two extremes, each with its make-up and character having a tendency towards the "positive" or towards the "negative" phase. In the case of either male or female, where there is a demonstration of definite disposition and possession of the "positive" phase, it is a living exposition—or an instance—where nature for some unknown reason, has been both gracious and generous to one individual, giving all the prerequisites which make life worth living, either at the time that the mother of this individual conceived and became pregnant, or added these many coveted virtues of individuality—possessed by the child,—during the term of pregnancy. The "negative" phase is just the opposite, where for some unknown reason nature has been unkind and sometimes even cruel in her apparent desertion of the individual, in some instances, depriving the individual of those vital qualifications necessary to a wholesome life; should such an individual survive there will be many years of mental anguish and physical suffering on his part, from childhood to old age, and much discriminating negligence on the part of society, during the life of the individual.

This positive phase has been defined as "personality" or termed "individuality" and sometimes called "individual congenital congeniality" or "personal magnetism," any and all of which denote the development or revelation of character and sentiment, especially required in a successful career in our every day walk of life, and much more so, when pursuing—in any instance—one of the several arts or sciences, as a vocation.

When the above or "positive phase" is compared or brought in heavy contrast with the "negative phase," which has been termed "no personality" or "no individuality" this "negative phase" in life, is truly an instance of individual catastrophe. There are many unfortunate human beings born into the world, who are, without question, in the negative phase class, the different forms and types ranging from the average misfit individual to the totally helpless and dependent imbecile or monstrosity.

The comparison of difference in these two extreme phases is so great in contrast that human conception is at a loss to understand it and therefore cannot define or give expression in mere words, as to the actual cause of the overwhelming absurdity on the part of nature.

We find in our every day walk of life the several types, in the negative phase group of humanity, in particular, the imbecile or idiot; the much talked of so-called moron, who is classified as a type of feeble-minded person endowed with a slightly higher degree of intelligence than that of an idiot. There is the pervert, sometimes called the degenerate, in its different stages of degeneracy

or its different forms of perversion. The inebriate, habitual or common drunkard who is, as a rule, commonly known as the "ne'er-do-well" or "good-for-nothing." The drug addict or so-called dope fiend, in its numerous forms. Perhaps it would be well to stop here,—although we could go on and mention many more instances and conditions, but the livid picturing of the many failings, shortcomings and imperfections of the human family, (which are indeed very great, much greater than the average individual can realize) will not add to the tendency of proud man, to overcome his moral, mental and physical delinquencies—to continue this morose and vivid description would surely be disgusting and offensive. It is not the intention to excite aversion or create a loathsome tendency towards these unfortunates. Enough has been said to bring home to the minds of those who read this book, the incomparable contrast of nature's productions, sometimes marvelous and sometimes freakish. At times mother nature seems good and kind in her donations and endowments of health, strength, beauty, intellect and virtue, and at other times she is cruel to the extreme when conferring or extending her much sought for favors. Call this a prank or a freak of nature or call it what you will; so far as is known today no one has solved the problem, except in the few instances where hereditary disease is said to play an important part and is materially to blame for the cause of the trouble. In any case of the negative phase, it is a life lived in sorrow and suffering, wrongfully rejected by society, unjustly condemned to isolation and deprivation. This is truly all the more pitiful

when we take into consideration the fact that such individuals are born into the world through no fault of their own and surely innocent of all personal blame. How often have the many unfortunate fathers and mothers,—in the hours, days, weeks, months and sometimes years, of their trials and tribulations—sat alone with their thoughts and wondered, asking themselves the same question over and over again, "Why should my child be an imbecile," especially when there is perhaps, a living example of the "phenomenon" type of individual, day after day before their eyes, in the form of a nearby neighbor's child.

It has been said "nothing succeeds like success." What then constitutes success? Many people will answer "personality." This answer again brings us back to the "positive phase" of our subject. If it is true that "personality" spells success, and it is alone responsible, partially or wholly, it is then obvious that many of us have been unduly cheated in life and greatly handicapped from birth; also the source of our failure has been pointed out. Many hundreds of times the question has been asked "What is personality?" and, is it inherited, inspired, or cultivated? What are the potential qualities in the make-up of this strange and exceptional characteristic, and how do you define it?

The term "personality" is applied in philosophy, as well as in common speech, to the identity or individuality which marks a being (person) for what he or she is, or marks the individual off for all that he or she is not. So do we hear it said, many times, he or she has "no personality."

We must all admit the many failings in the

make-up of the human being. In this instance, the proneness to criticism, on the part of the average individual; any statement whereby we make use of the terms, "no personality," aimed directly or indirectly, at any individual, seems the more important, in as much as, it is more commonly used with a disparaging tendency or insinuation of insignificance; any one of us dislikes to hear or have it said, that we have, "no personality," be it true or not.

It will be necessary to fore-go any further argument or discussion on the subject, at this time—on account of its foreign character so far as any definite knowledge is concerned,—because of its tendency to lead us nowhere or around in a circle back to where we started. However, we may concern ourselves at present, to this extent: from the use of the term "person" as distinguishing the self from the not-self arises the phrase "personal equation" for those peculiar characteristics or idiosyncrasies which have to be taken into account in estimating the value of an individual judgment or observation. The question of "personal equation" is especially important in the study and practice of medicine; it is reasonable to assume that the doctor of divinity, the doctor of law, the doctor of philosophy and many more, will also profess the importance of "personality" or the "personal equation" in each profession or vocation, in the different walks of life.

However, be all this as it may, the fact remains that these unfortunate individuals, as well as the fortunate, are with us. It is the unfortunate class, "of the negative phase," with which society has to

contend. One object in writing this chapter is to bring forth, if possible, some much needed light—in the way of argument, pro and con, by those men who have made a study of this question—on this obscure and darkened problem relative to nature's action or incomprehensible laws. As we read the chapters which follow, it may be seen, that it is quite possible, these few pages of strange and insignificant words of today, will in the near or far future, prove to be a small ray of light, weak and dim coming from afar, but the foundation of a welcome beacon of the future, whose powerful rays will penetrate the darkness of the recesses of the perplexing problem.

PART THREE

SCIENCE TRIUMPHANT
AND
ITS TRUE PRACTICE

TAKING for granted that "Mother Earth" was, at the beginning, as it is at present, the only and original abode of "man" and that all "life" in its different branches and phases had its origin upon "Mother Earth" we may proceed to relate in this part, "in accordance with science" and "logic," the following important facts:

The recognized worth of the late discoveries and improvements (in the practice of medicine) of an old theory, theme and study, now known as "Endocrinology," its practical and useful application in the treatment of disease, in the up-to-date practice of medicine, its late elevation to a place of prominence and its recognition as an important branch, in the field of medicine. The history of "Endocrinology" in a concise form; its wonderful possibilities of the future, in the practical treatment of abnormal conditions and disease, hereditary or acquired, in the human family. The new discoveries and lately recognized study of the ductless glands (from a scientific and practical point of view) which produce the internal secretions of the human being. The strange actions of these secretions or the apparent "factors" contained

within these internal secretions, the so-called "hormones" or "enzymes" or "ferments" or the "minute bodies" or so-called microscopic and ultra-microscopic "granules."

In this part we may also notice, human nature's transmission of physical or mental heredity traits and taint of class and kind, with its leaning tendencies toward color, stature, endurance, personality, health and disease. The necessity of harmony of function of the different organs and the natural or normal processes which are essential to the well-being of the individual. The abnormal or unnatural conditions as a result of disease, and the important factors, causes and reasons of diseased conditions in the different organs of the human body, from the standpoint of the "endocrine glands."

Here we may read the opinions of recognized learned men, in the different branches of science, all having a bearing, more or less, upon our subject. The few opinions mentioned here are in perfect accord with thousands of clinicians and scientific research workers (those men who seek and would know the truth), those who are famed in the history of medicine, and others who have been many times honored for their achievements in aiding all humanity throughout the civilized world, and who are therefore entitled to every consideration.

In this part of our work, we again find the importance of the ever essential and positively presiding element, "the blood-stream," in the human, driven by the heart through the vascular system in an uninterrupted stream, supplying all parts of

the body with all substances necessary for their growth, maintenance and function of production. In addition to being the carrier of the nutritive and waste substance of the body's metabolism, the blood is a very complex fluid tissue, and all of its constituents are not fully known. However, it may be said: the blood is essentially constructed of a watery consistency (plasma or serum) in which are dissolved various gases (oxygen, carbon dioxide, nitrogen, argon), organic and inorganic bodies, such as, proteids (fibrinogen, globulin, albumin), mineral salts (sodium, calcium, potassium), phosphates (magnesium, chlorides and other compounds), red cells (erythrocytes), white cells (leukocytes), platelets, fibrin, ferments and enzymes.

Under normal or abnormal conditions (as the case may be) the blood is said to contain such products as, acetone, sugar, creatinin, amino-acids, urea and other substances. There are also found the so-called "buffers of the blood," defined as, the direct defenders of the neutrality of the blood-stream, being composed of salts of either weak bases or weak acids, their function being to engage any invading acid or alkaline substance; having the ability to enable solutions in which they are present to receive additions of limited amounts of either an acid or alkaline substance. In addition to the above it is acclaimed that the so-called enzymes, ferments and hormones are contained in and carried by the blood-stream and that these "minute bodies" give to the constituents of the blood such properties as, first, the power to destroy bacteria and other foreign bodies; second,

the ability to combat or neutralize the toxins produced by bacteria; third, the protection of the individual against all animal, insect and vegetable poisons and, fourth, possibly adds to the power of coagulation of the blood, in cases of injury, thereby protecting the life of the individual.

For many years the following contentions have been held: that the blood is that part which carries hereditary tendencies which the child is believed chiefly to inherit from its parents; it is the supposed seat of the passions and emotions; in all pathological conditions where disease attacks the blood-stream, directly or indirectly, these diseases are nearly always fatal; principally among these diseases we find the several anemias and different types of dyscrasia. (The anemias are conditions in which the blood is deficient either in quantity or in quality or both, as found in wasting diseases, direct loss of blood, and imperfect nutrition, while the condition known as dyscrasia may be defined as any "abnormal composition" of the blood and humors or a "depraved state" of the blood, liquids and juices, of the human body, such as, invasions by parasites, bacteria and foreign bodies or any evil mixture of agents or products, having a tendency to cause serious damage to the blood-stream.)

From the above it may be seen, where is found or upon what is based, those olden time quotations "it is in the blood," and another, "the blood will tell." These inferential judgments and deductions being correctly or definitely made many years ago, by the old masters, purely from the standpoint of observation, long before modern

science made possible our present knowledge of the blood-stream. As we learn, more and more, year after year, thereby adding to our present and vast amount of knowledge (in the study of hematology) it proves to be a practical demonstration of the far-reaching complexity of what still remains (to a great extent) an unsolved problem, "the mysteries of the blood-stream."

CHAPTER XI

ENDOCRINOLOGY

"To him who in the love of Nature
holds communion with her visible
forms, she speaks a various language."
—*William Cullen Bryant.*

IN the concise presentation of an historical sketch of "Endocrinology" we should consider its progress of opinion and practice to the present day, as well as its early origin as a study of and its relation to the ailments of man. In the days of Hippocrates, the ancient Greek physician, philosopher and writer, sometimes termed the "Father of Medicine," we find much evidence of the theory and the practice, of our present-day subject, "Endocrinology."

According to Soranus,—a Greek physician, who was born at Ephesus, and who lived during the reigns of Trajan and Hadrian, in A. D. 98 to 138—Hippocrates was born in Cos, in the first of the 80th Olympiad, i.e., in 460 B. C.

Plato, sometimes termed the great Athenian philosopher, was born 427 B. C., and lived to the age of eighty; his literary work is said to have extended over the first half of the fourth century B. C.; he has referred to Hippocrates as an eminent medical authority.

The opinions of Hippocrates are also quoted by Aristotle, another Greek philosopher, who was a pupil under Plato; this is all the more important

when we learn, that Aristotle from the first, profited by having a father who, being physician to Smyntas II, king of Macedon, and one of the Asclepiads who, according to Galen, practised their sons in dissection, both prepared the way for his son's influence at the Macedonian court, and gave him a bias to medicine and biology, which certainly led to his belief in nature and natural science.

The original theory of "Endocrinology," (in the days of these ancient physicians and writers) was much the same as those views held today, to-wit; that every organ in the human has a function and is necessary to the human economy; that many of these contribute—to a greater or lesser degree, either by a process of secretion or excretion—a certain characteristic substance, pertaining to the well-being of the individual; that deficiencies of these organs or the substances produced by these organs were the underlying cause for certain diseases. The original practice, in accordance with these ideas, was a crude one, nevertheless logical in many instances; it consisted of administering to patients, the organs of the lower animals in different forms, certain animals being selected for the cure of certain diseases; the liver (being fed to the patient) was used for the diseases of the liver; the lungs for diseases of the lungs and so on. This practice was by degrees dispensed with, and in the revolutionary changes which followed, in the narrowing down to specific studies, not only of remedies but studies of organs and their functions, we have learned to consider only a few of the many glands in the human, as belonging in this class; and wonderful processes have been de-

veloped in their preparation for medicinal use. These are the ductless glands, their study being known as Endocrinology.

The pituitary and thyroid glands were known to Galen—sometimes termed, the most celebrated of ancient medical writers, who was born at Pergamum, or Pergamus, in Mysia, about A. D. 130—Vesalius named the pituitary in 1543 and the adrenal glands were described by Eustachius in 1563, the parathyroids were discovered in 1880 by Sanstrom. It was not until about the middle of the nineteenth century, when Claude Bernard (the French physiologist, born in July, 1813, in the village of Saint-Julien and died in Paris in 1878) by his work awakened the interest of the world. Then Charles Edward Brown-Sequard, (known as a British physiologist and neurologist, his father being an American and his mother a Frenchwoman) who was born at Port Louis, Mauritius, in April, 1817, and who in 1878 succeeded Claude Bernard, as professor of experimental medicine in the College de France, (where he remained till his death, in April, 1894) also contributed largely to our knowledge of "Endocrinology." He did valuable work on the "internal secretions" of organs. Since that time the study of internal secretions or endocrinology has gone forward in leaps and bounds.

Ever since the year 1880, up to the present time, we find many men have done good work in this field of study, and some of our very prominent physicians and scientific workers continue to carry on, in this interesting and promising field of human endeavor. So it may be seen, from the above

historical dates and the general character of those men involved, "Endocrinology" as a study, has both time and logic to its credit. Here also we find at times in illustrative literature, the mixture of medicine and religion—a remnant perhaps, of the Mosaic laws—in the days of the Greek philosophers, physicians and writers of ancient times. The latter day workers and present day investigators have attacked the subject matter, not only from a scientific view, but from a clinical and practical standpoint, involving much laboratory work and research.

The branch of medicine which makes a special study of the ductless glands and their internal secretions, in health and disease, is called Endocrinology. All of these glands are, when in normal condition, giving into the blood stream of every individual the normal amount of their product, "the internal secretions," but one or more of these glands, at the same time or perhaps first one and then another at different times, are under certain conditions and stimulations, subject to an over-acting or to a lessened activity. In other words, they may work over-time and produce more of their particular secretion than the human body can use or care for; this then acts as a poison and the individual suffers a toxemia from over-production. There are other cases and instances where these glands, one or more, "go on strike" or "lie down on the job," so to speak, and do not produce enough of one or more of the necessary internal secretions and as a result the individual suffers from want of these products in the blood stream.

The study of these glands and their internal secretions is yet in its infancy. The hidden mysteries and great possibilities we may expect in the solution of the problem have just begun to come to light. When the day comes that we can determine by some process or test, just what amount of internal secretion is required from each gland in a given case or individual, and how we may regulate that amount, so as to give to the individual that normal balance required to maintain a physically strong and healthy body, and just what the exact relation of one of these glands is to the others, then it is possible that we may be in a position to call forth at the time of emergency that so-called "Elixir of Life," which imparts to the individual the vim, vigor and vitality of youth.

At the present day it is a difficult matter to say just which of these glands is the most important as an organ of function in any human being. Some claim one, some another. We know by experience (in cases where it became necessary to remove some of these glands, due to disease or injuries and from experiments on animals), when some of these glands were removed in their entirety, in a great many instances, the operation was fatal. It is also a known fact, that when some of these glands have been transplanted into individuals, as a last resort to save life, the result was fatal. It being proven, that the gland transplanted reacted with an antipathetical effect and to the contrary of our intentions to do good, resulting in the death of the patient. We have learned that some of these glands are of vital importance the removal of which always ends fatally. Those of

most importance and which have possibly received most attention and study and especially of late years, are, the pituitary, thyroid, adrenals and gonads of male and female; next in importance come the thymus and parathyroids in this group.

It must be stated here because of what is to follow, that there is a common complaint or disease known to the human family as mumps or parotitis which is an inflammation of the parotid or salivary glands. This condition as a rule is of litfle importance or consequence, at the same time it must be remembered that many cases result fatally. In these fatal cases there often is a condition resembling typhoid fever or there are nervous symptoms followed by delirium and convulsions. In many cases there is a high temperature from 101 to 104 degrees F. and other symptoms of severe toxemia. The cause of the disease is unknown, the pathology obscure and there is no specific treatment. There are cases on record in which the symptoms have resembled those of an acute pancreatitis or an inflammation of the pancreas, indicating the pancreas has taken some part in the disease. As an aftermath in mumps there are many complications in both male and female. In the male one or the other or both of the interstitial glands (gonads) may become hard, swollen and painful, this is known as orchitis and is of serious import as in many cases when both glands are affected as a consequence there is a rapid atrophy and the serious sequela of inability to procreate. In the female the breasts or mammary glands sometimes become tender and enlarge and in some cases the interstitial glands

(gonads) become affected. It is a recognized fact that the interstitial glands and the mammary glands of the female are related and in sympathy with each other.

After the above statements we find, (by observation) that the interstitial glands of male and female and the pancreas, all of which have been mentioned before, are in some way associated. The new introduction is the parotid or salivary glands which are without a doubt also involved in the question of internal secretions, yet the parotid glands are not placed in the class with the ductless glands. It would not be surprising, if in the near future, research work would prove that the parotid glands should be included in our glands of internal secretions. There is enough substantial evidence in our medical literature today to prove that all these glands are related or in some way closely associated. From the above statements we may presume so far as to assume that the secretions from the salivary glands are in some way related to the internal secretions, for we will now see that the secretions from the salivary glands also contain these so-called hormones, enzymes or ferments.

In a long fought battle with the innner-most secrets of nature, scientific research has of late years conquered to a marked degree thereby adding to its credit a remarkable victory which is worthy of notice. As a result of this triumph we now have a new department of treatment, which has recently proven to be of great advantage in the practice of medicine. The report of this new discovery apparently rings true and the vibrations

of its echo resound of good promises and prospects of material benefits for the human family of today and of tomorrow. It is quite evident that no one individual human brain, no matter how strenuous would be the intelligence of mental capacity, will ever work out this problem. The accumulation of practical and scientific work of many men of many minds with the addition of much time, will no doubt, some day, bring forth its entire solution as a whole, separating those organs of the "true endocrine" aspect, from those organs (the false endocrine glands) which are intimately, or apparently so today, related to the "true endocrine glands." Before proceeding farther we will outline briefly those apparent "false endocrine glands," all of which play, no doubt, an important part in the apparent "true endocrine system," possibly from the principle of "a foundation position" in the function of the "true endocrines" and the production of the "hormones."

Due consideration must be given the "liver" in the human; from the standpoint of size and weight, number of functions performed, together with its "portal circulation," it may be called the largest individual organ in the body and the most important in the system of general mandatory functions; pertaining to the "foundation position" of fundamental principles of the metabolism, endocrines and excretory mechanism in combination.

It is presumed that the pancreas is an organ with both an internal and external secretion. The external secretions are trypsin, steapsin and amy-

lopsin which aid materially in digestion. The most important disease in the human, from disturbed function of the pancreas, is diabetes mellitus. When the pancreas is removed, the result is diabetes mellitus. The pancreas seems to regulate the mobilization of all sugar products taken into the body. There seems to be a relation between the pancreas, adrenal glands and blood stream. These three factors apparently have much to do with, and exert a well defined control over the immunizing powers of the body concerning the resistance of the body to infectious diseases.

The spleen is supposed to be much concerned in the production of the red blood cell and also to act as a graveyard for all red blood cells. In other words, the red blood cells are born with the aid of the spleen and they return there to die. There is very little definite knowledge regarding the spleen, except it is very closely related to the blood stream, and becomes either enlarged or may atrophy in diseases connected with the blood stream. In some of these diseases of the blood stream it becomes necessary to remove the spleen.

So far as the so-called interstitial gland (testis in the male) is concerned, in accordance with all the natural laws of propagation and all scientific postulates, recognized authorities admit the following. Primarily, the initial and essential function of this gland is, to produce the spermatozoa, which must necessarily pass through a form of evolution and growth involving several stages—a process which when investigated, seems to give the impression that these apparently animated

animalculae (known to be alive, being possessed with an unmistakable motile function, as seen under the microscope) in the natural state, are possessed of several functions, and developed by the thousands, apparently, from nothing and nowhere (unless it be the nutrition of the human body process, [metabolism,] assisted by the blood-stream) in this gland, year after year, eventually becoming the male factor of the fundamental principle of a future human being.

Many times it has been remarked, the genius or the artist is born not made;—meaning, the exceptionally talented individual who has surpassed his fellows as a painter, musician, writer, and many other instances in life—it is true that the individual must be trained and his or her talent developed, but if the foundation of the genius or artist is not there, as a primary factor, no amount of training and attempt to develop will produce the intended or sought for result; if the stone which comes into the diamond-cutters hands, is not primarily a genuine diamond no amount of labor in cutting and polishing will produce a genuine flawless diamond. Therefore, it may be true that, the genius or artist is born and not made. Then it is reasonable to assume that this individual acquisition is promoted or bestowed upon him or her before birth and may be considered as an "individuality" or "personality." It would be indeed interesting to learn the truth relative to the precise part played, by these endocrine glands, in the giving of those exceptional qualifying characteristics or to know the exact manner in which these glands mold into being the distinguishing

features (sometimes to a marked degree) of every man or woman as an individual.

The work on the subject of Endocrinology, which has come to light in recent times both scientifically and practically, is most gratifying and encouraging. The satisfactory evidence produced in the past decade relative to Endocrinology, including the endocrine glands, their internal secretions, with its hormones and their functions of inhibition and stimulation in health and disease, tends to demonstrate and open the way for a more efficient treatment of those cases whose symptoms complex (a number of complicated symptoms) was not very well understood in the past.

The transcendent fact lately established by some of our most eminent and well balanced men in the practice of medicine, regarding these hormones and their all important significance in relation to the health of society and the destinies of the future treatment of disease, has a tendency to show that the study Endocrinology is here to stay and it follows that the foundation is laid upon which will be built, in the future, the explanation of how this branch of medicine can and will come into harmony and alleviate those vexatious problems and sordid contentions with which we came in contact, and with which we had to deal, in the many years that have gone.

If we should take for granted, (so as to follow a reasonably sane and directly linked chain of thought) that there are three sets of so-called "endocrine" glands, in the human, and that each set is divided into at least two (perhaps more) classes, which may be termed class A and class B;

then it should not be a difficult matter to perceive the simple manner in which all these organs function in harmony with each other. As all these glands are known to be more or less implicated in the "endocrine system," especially in the dual purpose of the protection and production of life, we find an organization something in this order; first, the excretory or "foundation position" set of glands, of which in class A we have the liver and portal circulation, the stomach and small intestines, the pancreas and salivary glands, the spleen and lymphatic glands, all of which act as the primary essentials of assimilation of nutritive substances, when taken into the body; in class B we find the lungs and heart, the kidneys and urinary tract, also the colon (large intestines), these would answer for the purpose of elimination of all waste products after the process of assimilation (metabolism) has taken place. Or we may term these organs the containers, mixers and converters as well as the users, carriers and dispensers of all raw materials taken into the body, in the form of foods, gases, liquids and solids. Second, in the set of secretory or "true endocrine" glands we find in class A the pituitary, thyroid and adrenals, and in class B the thymus, parathyroids and pineal glands; all or part of these glands would seem to utilize the products of the "foundation" set of glands. Or we may say these glands (or their products, the hormones) act as the builders and molders of character as well as constructors of the different tissues, in a primary and secondary way, with a subsequent development and growth of the individual. Third, we have the reproductive or

"pseudo" (in a way false endocrines) set of endocrine glands, (their purpose apparently being to procreate the spermatozoa), and with the aid of the "true endocrines reproduce life; in class A we find (in the male) the testis and blood-stream, and in class B the prostate and seminiferous tubules (store house for the spermatozoa); in the female there is in class A the ovaries and the blood-stream, and in class B, the fallopian tubes and the uterus (womb). The culmination of reproduction occurring only when there takes place (generally or normally, in the uterus, but not necessarily so) an amalgamation of the matured products of both the male and female reproductive glands. Viewed from another angle we may put it this way: the set of "foundation position" endocrine glands produce the hormones which are the "physical" workers; the "true" endocrine glands produce the hormones which are the mental workers, and as a consequence of this retinue of systematic physical effort put forth and the regime of mental energy expended on the part of both glands and hormones in these two sets of glands, there is at the proper time (the age of puberty) produced in the third set of glands (in the gonads of both sexes) the necessary germ of life, each contributing to the final culmination (the amalgamation of the male and female elements in the uterus) which would produce life and at the same time give to the prospective offspring the characteristics of the father and mother or both, or one of their families.

We have therefore accounted, in this chain of reasoning, (admittedly, in a crude manner), for the three most essential factors involved in the

continuous cycle of all animal life, namely assimilation, growth and reproduction or as viewed by many authorities, who claim that, "life itself" is a combination of functions, development and growth; which is one and the same thing. After the reproduction of its kind, in any instance there naturally and necessarily follows a repetition of the life cycle, beginning with assimilation of food; resulting in the growth and maturity; with a consequent reproduction of kind.

CHAPTER XII

THE HORMONES

THE mysteries concerning the functions of these hormones found in the internal secretions of the ductless glands have just begun to explain themselves. Knowledge of their exact relations to each other and their specific function is still wanting and awaiting investigation. Those who will take up this work will find a vast field of possibilities and unlimited opportunities for great discoveries awaiting their efforts. Of late years there is a wealth of literature on this subject. No other branch of medicine can produce, in quantity and quality, during a similar period, the enormity of literature which has been written on this subject. There has been much criticism offered. Organotherapy of the gonads has suffered most. It is not, of course, a question to be discussed in the home at the dinner table by the family circle. The little children do not understand, they are young, care-free and are not interested. But every father and mother should know the full significance of this all important subject. It is important that they should know, if they would be a true parent and desire to rear their children to be healthy and happy and would see these children develop into strong, healthy, and happy, men and women. While this subject may be considered a "delicate" one, and even improper, by some, the days of the old-fashioned false pride, together with the ignor-

ance of long ago, as to the functions of all parts of the human anatomy, in at least a general way, is now a thing of the past. It is only by a knowledge of our physiology, anatomy and the ravages of disease in their different processes, that we will eventually learn how to care for our health and maintain that good health, when we have good health and avoid things which may cause disease and rob us of a healthy, clean body. It has been written "The disciples did say unto our Lord, 'When wilt thou be manifest unto us and when shall we see thee?' He saith unto them, 'When ye shall be stripped and not be ashamed.' "

It is surely unbecoming and beneath the dignity of an ethical physician to promote radical measures or foster pet theories of dreamers, to the extent of putting them into practice (in the human family) before being submitted to scientific and experimental investigation. The writer will advance a theory in this work (The Gengemmule Theory) but wishes to make it plain that it is to be considered only as a theory and does not claim its advocation as a subject of practice. However, it will be recognized, that the theory is based upon many facts both scientific and practical.

The dangers of these radical measures and pet theories to society come through misleading statements and false impressions created by publicity, before sufficient information is gained and reliable tests are made as to their actual worth and true merits, thereby proving them as bonafide facts. It is never necessary to do any romancing—we can well afford to leave this sort of thing, with its composition of extravagant story-telling and its

pompous extravaganza, of a fictitious and extraneous nature, to the novelist and the dramatist—nor parading with brass bands, to herald far and wide the information of any new discovery in the field of medicine and surgery. The merits of any new discovery will, at all times, speak for themselves and in due time the genuineness of its truism will become known throughout the world.

Nowhere in the whole realm of medicine will there be found a more fascinating branch, interesting as to scientific facts, more important as to its relation to all physiological and pathological conditions, than this study of the ductless glands and their products, the internal secretions which contain these hormones. It is, therefore, important to every human being, from infancy to old age. It is by far, a greater and broader matter, than the question of the gonads alone; it is one which entails an involvement of nearly all vital organs pertaining to the health and happiness of humanity, and most authorities contend that it should be treated as such, if treated at all. One author writes as follows: *"In all ages of life, the activity of mind and body are registered on the dial of life in proportion to the nourishment of its tissues which are dependent to a great extent upon the activity of the ductless glands and their amount of internal secretions."* This means practically that the human being will live with a healthy body, half live or die with an unhealthy body, at the dictation of the ductless glands and their products. Death, in the broad meaning of the word, is applied to the animal organism. Death is at all times due to cessation of function, caused in each and

every case by the absence of a factor. Lack of, or an increase of, the internal secretions is the factor which, many times, causes death. In other words, the hormones in the internal secretions, are for some reason, known and unknown, reduced below a minimum or increased to the maximum; activation ceases, for instance, the heart, or lungs will stop working and death ensues.

Life is composed of a cycle, beginning with reproduction, followed by assimilation, metabolism, and growth, and then we complete the circle by again coming to reproduction; but what is the hidden power of the progressive progress? We will now venture a bold statement, not yet proven a fact but a possibility. It is quite possible that in some future time it can be demonstrated and proven as a scientific fact, that these ductless glands together with the contents of their productions, are in every respect responsible for our existence as human beings. *Also, that these glands determine our character, making us good or bad morally and socially, weak or strong mentally and physically, tall or short in stature, lean or fat in figure;* that they govern the growth, distribution and color of the hair on the body; control the radiant or sallow complexion and give color or pigment to the skin, making it white, yellow, red, brown or black; that they regulate and confer upon us the susceptibilities and immunities to disease. *In fact, these glands in every instance, give us our individualities, making us what we are, as a man, or a woman.* When this time arrives it will be learned, no doubt, that the

sole factors of importance will prove to be those minute bodies, the so-called hormones.

As an illustration, we used to say in chemistry, all things conceivable to the senses are made up of matter and mass which is composed of gases, liquids and solids all of which, when subjected to certain conditions, will eventually become or be converted into another gas or some one of the higher ethers. The study of these ultimate higher ethers is another question,—the so-called pantheism; not the religious aspect, but to the contrary, the philosophical view. These gases, liquids and solids are said to be composed of molecules and the molecules in turn made up of or composed of atoms and these atoms being or are believed to be the smallest thing which was known in chemistry. All chemistry was based on these laws until a few decades ago; then the scientific investigators came forward with a new theory and now claim they can prove that these atoms are made up of hundreds of thousands of small bodies called electrons or ions which are now admitted to be the smallest known component of matter or mass.

At one time it was believed, and is still the belief of some, that the cell with its nucleus, protoplasm and cell membrane is the smallest known part of any organ in the body. Of late years the scientific investigators claim there must be something smaller than the cell, producing their evidence to prove it. It must be remembered here, that many years ago there was much talk of hormones, enzymes and ferments, but no one knew what they were. These men knew there must be something which showed strange results in the re-

actions of experimental work and different men gave them different names, hence we have the names hormones, enzymes, ferments, and several others. Other investigators noticed the results of the "presence" of the so-called granules, gemmules, idioblasts, bioblasts, protomeres and idiosomes. Here we have a repetition of the above circumstances, where different men gave different names to the same small bodies or particles.

At the present time the contention seems to be that all these "minute bodies" are (to a marked degree) one and the same thing, call them hormones or granules as you please. The question now is; have they relatively the same function and if so, what is the specific function, of each group? In other words, the scientific world had just accepted the cell theory as the ultimate morphologic and physiologic unit of life. Then came forward the late day scientific investigators, taking up and utilizing the results of the work done by other men in the past thirty or forty years, and by corroboration and co-operation with this work and in conjunction with their own research work, now claim there must exist simpler and smaller elementary units or organisms which themselves are the fundamental component principle from which the cell is, in its elementary stage, made up. These are the hormones, as we will call them.

If we can in any plausible manner prove this theory, it will then be quite possible to account for the heredity tendency in the human family "unto the third and fourth generations." There are instances where a child will have characteristics of the grandfather or grandmother on the side of

the father or mother, such as, certain features of the face, the shape and color of the eyes, the color of the hair or the shape of the head, hands or feet. This would also hold true in hereditary disease "unto the third and fourth generations," also certain immunities and susceptibilities to disease which is called by the laity, on the one hand, good health; on the other hand, poor health.

As an instance, for the purpose of illustration, in the propagation of frogs it is reasonable to assume that there is a quadruple manifold force, of voluminous variety of minute ultramicroscopic granules, in the form of male and female reproducing elements, contained in the spermatozoa of the male and the same combination of constituents in the ovum of the female. Taking this for granted, why not assume that there are contained within the individual spermatozoa (the male element of reproduction) two different groups of factors, which may be termed the positive and negative or the "male and female" groups, also that this same condition applies to the individual ovum (the female elements of reproduction) and that the male elements of the spermatozoa unite with the female elements of the ovum and the male elements of the ovum unite with the female elements of the spermatozoa. In this manner there would be a strong possibility of explaining one of those hidden phenomena in the process of reproduction, which is, molding of a combination of the features of "the family resemblance," of either or both mother and father (in the human), so commonly reproduced in the new-born of its parents.

This is all the more a reasonably logical fact,

when two factors are once more pointed out, first, that it is a recognized fact that these ductless glands which produce the internal secretions, containing these granules, are the basic physiologic regulators which sustain life after once the human being is born into this world and that these ductless glands maintain that same vital phenomena within the realm of life in which it lives, incorporated in the life of that human being. Second, it is, therefore, a natural consequence that these granules could be and should be contained within the spermatozoa of the male and the ovum of the female, in numerous quantities from the different glands, because these granules are thrown directly into the blood stream, being carried from the different glands to the interstitial glands or gonads of male and female, without coming in contact with the outside world and therefore are not subject to alteration in structure or composition from any atmospheric action, but deposited by the blood stream into the interstitial glands of both male and female where, no doubt, they play the important part in the manufacture or production of the matured and live spermatozoa in the male, also in the fully developed ovum in the female; it being quite possible that these two secondary elements contained within the spermatozoa and ovum are mostly or entirely composed of these granules.

This being the case, life would not have its primary beginning in a prospective mother, at the time of conception, but would begin in both father and mother, long before the mother (of the child to be) had conceived, namely, at the age of

puberty. This would give us a better and more clear insight into the recognized law "like begets like," this biological law, no doubt, is primarily dependent upon the proportional health and function of the ductless glands of the parents of the newborn, and secondarily, upon the ability of the reproductive organs of the male or female to accumulate or take up in larger or smaller amounts these granules, which would thereby determine the dominating features and characteristics (in the child to be) of the father or the mother as the case may be, or members of their family.

These hundreds of millions of peoples, who are (at all times, more or less) all affected in health and afflicted with disease, by the increase or decrease in the function of those same little glands, each and every one, more or less at different times, all come to the physician in the hour of illness, for aid. If we are to view the situation from the standpoint of gland transplantation it may be summed up in a few words as follows. All these peoples are patiently waiting for the explanation of this vital phenomena, for which they are both ready and willing to pay great tribute. These peoples will hail such a man, as a "Saviour" of all mankind. There are only two small requirements necessary in a given case; first, name the gland to be used; second, tell where and how to place it so it will function (thereby producing the proper hormones) for the benefit of the individual; and then "prove" your operation is a success beyond question.

We may say, these granules, hormones, enzymes, or ferments, are minute bodies, which ulti-

mately will be proven to be the beginning and ending of all life, animal and vegetable, and that it will lie within the power of the future family physician to form or change certain features and other characteristics in the production of life, by close observation and treatment of these glands of internal secretions. All this may come to light in the near or far future, by giving doses of different kinds of gland extract. This would indeed be bringing about the Millennium in the human family without any operation.

CHAPTER XIII

VERSED OPINIONS

ADVANCEMENT of "science and research,"—termed at times, "the sole foundation" of a true practice—is never an over-night mushroom growth, but in every instance is based upon facts which act as our stepping stones. Here will be interspersed some of those incidents—in the form of expressions and opinions—whose influence must be recognized, in our march of progress; the fruits of which all civilization has enjoyed, some of which have, in their crystallization, startled the whole world and passed far beyond even the mind of the dreamer and original builder. As our guide, —for the purpose of a better understanding and a more comprehensive delineation of our comparatively new subject, "hormones,"—it is apropos, at this point, to cite the expressions and opinions of the many men engaged in the different fields of science, research and practice,—men whose recognition has been granted, because of what they have said; what they have written; what they have done;—all of which has a bearing on, and therefore has added much (from their several angles) to our "mother" subject, "Endocrinology."

"Take from the air every aeroplane; from the roads every automobile; from the country every train; from the cities every electric light; from the ships every wireless apparatus; from the shops all motors; from office buildings every elevator, telephone, and typewriter; let epidemics spread at

will; let major surgery be impossible—all this and vastly more, the bondage of ignorance, where knowledge now makes us free, would be the terrible catastrophe if the tide should ebb to the childhood days of men still living. Therefore, whoever desires progress and prosperity, whoever would advance humanity to a higher plane of civilization, must further the work of the scientist in every way he possibly can."

—William J. Humphries.

"It is a strange feature of the modern educational process, that although children are born richly endowed with scientific instincts, they encounter from the cradle to the university constant opposition to the education of these instincts."

—Joel H. Hildebrand.

"A half-educated man knows enough to criticize and abandon the customs of his father, but not enough to preserve their merits or to improve their defective parts."—Thorndike.

Several months after Dr. Maxmilian J. Herzog had passed on, there was published a résumé of his work in the form of a monograph (a systematic exposition of one thing; in this instance, a description of the so-called hormones, or enzymes or ferments) entitled, "A Contribution to the Study of the Nature of Enzymes." Extracts of interest from different parts of this monograph are as follows:

"About twenty-five years ago, while studying the blood of a certain acute infectious disease, the cause of which remains unknown even to-day, the author made some observations and from them drew certain conclusions. It is not necessary for our present purpose to discuss here whether these observations themselves were correct or not; they suggested at the time, however, that the disease

studied was due to exceedingly small live granules; that these were multiplying in the blood; that the morbid process was to be looked upon as a pathologic fermentation; that every fermentation ultimately was due to such minute, either barely visible or entirely ultramicroscopic, granules; that, in other words, unformed ferments or enzymes were not chemical bodies in the common sense of the word, but something alive, possessing all of the properties of live substances—namely, the power of assimilation, metabolism, growth, and reproduction; that they were, in fact, the real basis of life, the true elementary organisms of all that we call life; and that the latter, in all of its phases, was due to the activities of such exceedingly small live ferment granules.

"These, of course, are very bold, revolutionary, and startling ideas. We have become so thoroughly imbued with the belief that trypsin, ptyalin, and other enzymes are purely chemical compounds of complicated, though not yet known formulæ, we are so firmly in the fetters of this fixed idea, that it must be as difficult to the average physiologist or physiological chemist to conceive of the metabolism, growth, and reproduction of an enzyme as to conceive of the metabolism, growth, and reproduction of an ordinary chemical compound like sulphate of copper.

"Yet we will be able to furnish in this paper convincing, incontestable, experimental proof of our conception.

"At the time when the author first came to the above conclusions (1894), nothing was known of ultramicroscopic, filterable viruses as the cause of such diseases of higher animals as, for instance, foot and mouth disease of cattle, hog-cholera of swine, etc. There had already been described, however, by Beijerink, the 'mosaic disease' of the tobacco plant, in which the virus could be filtered through clay filters and the disease could be transmitted by the cell-free filtrate from plant to plant.

The virus, therefore, was called a 'contagium vivum fluidum,' (a fluid alive with contagion).

"After having formed the idea that enzymes were either composed of ultramicroscopic or nearly ultramicroscopic granules, it was thought that it would be very easy to demonstrate this by the use of bacteriologic methods of transfer from one suitable culture medium to another. The enzyme selected for proving the theory was ptyalin of saliva and malt diastase, now often called animal and vegetable amylases. The fermentation product of these enzymes is maltose, which can be very easily demonstrated and determined quantitatively by a number of tests, preferably by using Fehling's solution, volumetrically, or according to Allihn's method, gravimetrically. These amylolytic enzymes, therefore, appeared the most favorable objects for furnishing the experimental proof desired. The first difficulty met with in working with saliva and diastase of malt was bacterial contamination. This, however, was completely overcome in the course of time, because comparative tests demonstrated in carbolic acid and sodium fluoride two strong antiseptics which did not interfere with amylolytic action, even in compartively strong addition, but even increased it in moderate percentages of carbolic acid and in rather high percentage of sodium fluoride. By the use of these antiseptics, therefore, bacterial contamination could be prevented and the activity of interfering microörganisms could be excluded without loss of amylolytic action. Still, when transplants according to bacteriologic methods were made from fermenting starch solutions to sterile non-fermenting ones, amylolytic action could never thus be transferred in a sufficient and convincing manner. This was then ascribed to the detrimental, inhibiting influence of the fermentation products—dextrines and maltose, present and accumulating.

"After producing evidence to justify our work on this problem, and before going into the detailed

experiments, we shall endeavor to throw some light on the subject by stating here the ideas of others. We shall show how the trend of biological thought leans toward the end we have in view. Many workers have had ideas similar to our hypothesis, but none have yet attempted to prove or offer any proof for their contentions.

"A short time after the more modern conception of the cell had been formed, following the publication of Schleiden and Schwan, the conviction was expressed that the cell could not be the ultimate morphologic and physiologic unit of life; but that there must exist simpler and smaller elementary organisms which themselves are the building stones of the cell. This idea permeates the entire history of modern biology. Hule, as long ago as 1841 stated that the cell possibly was made up of simpler, vital units which would rank between the cell and the chemical molecule. Bruecke, while refusing to adopt Hule's conception, in 1861, stated: 'We therefore are compelled to ascribe to the cell, aside from the molecular structure of the organic compounds which it contains, another structure, complicated in a different manner, and this is what we mean when we speak of the organization of the cell.' Later on Darwin, Spencer, Naegeli, Eisenberg, Haeckel, DeVries, Strassburger, Weismann, Wiesner, O. Hertwig, and others, advanced theories, maintaining that the cell must contain simpler organisms since their existence only could explain the problems of cell life, of evolution, and of inheritance. C. O. Whitman in his lectures, 'The Inadequacy of the cell theory of development,' (Vol. 2, p. 112, Boston, 1894) says: 'We have long been aware that the cell could not be taken as the ultimate unit of life and every notable effort to account for heredity has led to the postulation of primary elements in comparison with which the cells appear as complex organisms. Since Ernst Bruecke first contended for the organization of the cell in 1861 and the existence of

smallest parts as the basis for this organization, we have seen similar ideas in the physiological units of Herbert Spencer, the gemmules of Darwin. We will find the secret of organization, growth, development, not in cell formation, but in those ultimate elements of living matter, for which idiosomes seems to me an appropriate name. What these idiosomes are, and how they determine organization, form and differentiation, is the problem of problems on which we must wait for more light. All growth, assimilation, reproduction and regeneration may be supposed to have their seat in those fundamental elements. They make up all living matter, are the bearers of heredity, and the real builders of the organism. Their action and control are not limited to cell boundaries.'

"Hertwig in his book on the cell (English translation, London, 1895) in giving a résumé of his conception of the cell, says: 'We are forced to the conclusion that the cell is a highly organized body composed of numerous minute different parts, and that hence it is in itself to a certain extent, a small elementary organism. . . . It is, of course, necessary to consider that the hypothetical idioblasts must possess the power of multiplying by means of division like the higher elementary units. . . . Darwin, Naegeli, DeVries, therefore, logically assume that their gemmulæ, particles of idioplasm and pangenæ are both able to grow and to divide. This assumption enables us to draw another conclusion, about the nature of idioblasts, viz: that by their very nature they cannot be identical with the atoms and the molecules of the chemist and physicist, for the former are indivisible and the latter, although divisible, split up into portions, which no longer possess the properties of the whole. . . . On this account the idioblasts are not identical with the plastidules, the existence of which is assumed by Eisenberg and Haeckel.'

"Wiesner: (die Elementarstruktur der lebenden

Substanz, Jena, 1892) states: 'The assumption that protoplasm contains organized separate particles which are capable of division, and that in fact it entirely consists of such living dividing particles, is forced upon us as the result of recent inquiry. By means of division of these particles, growth is brought about and all the vital processes occurring in the organism depend upon them. They must therefore be considered the true elementary organs of life.'

"Watase: (The Nature of Cell Organization, Biol. Lectures, vol. 2, Boston, 1894), a pupil of C. O. Whitman, states: 'The behavior of the cytoplasm thread or net work suggests that it is formed of a group of small living particles, each with the power to assimilate, to grow and multiply by division. The chromosome in the same way is itself a colony of minute organisms of another kind, each endowed with similar attributes of vitality. The media in which they live, the cytoplasm and caryolymph, are the media in which they breathe, from which they derive their nourishment, or within which they deposit the products of their metabolism. The reason why the cell as a whole assimilates, grows and divides is ultimately due to the fact that the minute particles which compose the cytoplasm and the chromosomes are endowed with these functions.'

"While Darwin and other biologists assumed the existence of elementary units without entering into any morphologic considerations, there came later on a number of investigators who attempted to find such units by microscopic methods and to reduce the structure of protoplasm to component simple morphologic elementary bodies. A number of theories of the morphologic structure of protoplasm and of simple elementary units were propounded especially by Fleming, Altman, and Butschli. M. Heidenhain in criticizing these theories, very properly and in strong terms insists upon the futility of such attempt which searches

for the ultimate organic units of life as something of necessity visible. He points out how irrational it is to suppose, *a priori,* that these ultimate units of life should fall within the limits of the power of the microscope; and he holds that we must reckon with the probability of an ultimate meta-microscopic structure of the cell and of the protoplasm. Pfitzner observed in 1882 that chromatin granules of the karyosomes of cells of salamandra divided, and that, in fact, the division of the chromosome depended upon the division of such granula. This observation subsequently was confirmed by Fleming and others. Brauer (Arch. F. mikroscop Anatomie, vol. 42, p. 203) in studying spermatogenesis of ascaris meyalocephala, noticed the same division of chromatin granula. He looks upon this division as an independent act of reproduction and says that he does not look upon chromosomes as independent individuals, but only as the components of innumerable, small chromatin granules. The latter only he considers as truly individual units.

"In Wilson (The Cell in Development and Inheritance, New York, 1900) we frequently find the idea expressed that the chromatin granules might belong to the much-looked-for elementary organisms. The author, for instance, says (p. 114): 'These observations certainly lend strong support to the view that the chromatin is to be regarded as a morphologic aggregate, as a congeries of or colony of self-propagating elementary organisms, capable of assimilation, growth and division.'

"Wilson also considers the possibility that what we can see does not yet show as the true elementary organism, and he states further on (p. 292): 'Yet we may still inquire whether the power of division shown by such protoplasmic masses as plastids, chromosomes, centrosomes, nucleoli and nuclei, may not have its root in a like power residing in ultimate protoplasmic units of which they are made up.'

"Could we accept such a view, we might more easily meet some puzzling cytological difficulties. It may, however, again be pointed out that it would be quite irrational to conclude that the smallest visible granules first come into existence when they first come within view of the microscope. The homogeneous substance must itself consist of granules still smaller. The real question is not whether such ultramicroscopic bodies exist, but whether they are permanent organized bodies, possessing besides the power of growth, also the power of division.

"The belief that visible cell granula, demonstrable by various staining methods, are the looked for hypothetical elementary organisms, found its strongest advocate in the skillful and resourceful histologist Altman. The fundamental principle advocated by this investigator is the following: The cell is not an elementary morphologic and biologic unit from which can be derived directly the physiologic activities of the organism. The cell is, both from the morphologic and the physiologic view, a complex structure; it is a colony of granules; i. e., of live beings or bioblasts, which may be be compared to free living microörganisms. The cell granules or globules possess independently the property of assimilation, growth, and especially reproduction, and they possess the property of differentiation so that they can take upon themselves various functions of the cell. Even Altman, however, conceded in later publications that the visible granules might take their origin from still smaller invisible granules, although he insists upon looking at the visible granules as elementary organisms. It is rather unfortunate to compare and place side by side, the hypothetical elementary biophoric units and unicellular microörganisms like bacteria, because the bacterial organism, as everybody who has done much bacteriological work knows, is not at all a very simple body and is no more a real elementary organism of bioblast

than a tissue cell of a higher multicellular being. A very important objection against Altman's claims, as pointed out by Verworn (Allgemeine Physiologic Jena, 1897, p. 67) is the following: Altman has failed to demonstrate that his granula show the general functions of life, and without such a demonstration one cannot speak properly of an organism. Verworn, however, raises against Altman's granular elementary organisms, an objection which is not at all valid; namely, that it is not permissible to speak of an elementary organism in a cell unless we are acquainted with free living elementary organisms of this type. This is not sound reasoning in itself, because there might be an elementary biophoric unit in the cell which does not exist anywhere free in outside nature; or such units may exist, live, and multiply, outside of the cell, but they might heretofore have evaded detection. The latter, of course, is what really has occurred in the past. Verworn, however, could not see it thus, and his final conclusion is that the cell is the individuum of the lowest order, that it is indeed the elementary organism itself.

"Wiesner (quoted from Heidenhain) believes in the existence of smallest ultra or 'meta-microscopic' bodies, representing the last ultimate limit, where divisibility of the living substance ceases, because mere fractions of the ultimate unit will no more possess the character of protoplasm or of a live body which can multiply by division. O. Hertwig has accepted Wiesner's theory. Heidenhain calls those hypothetical smallest, ultimate, 'meta-microscopic' bodies 'protomeres' and he believes every form of growth to be due to the division of these bodies. He also holds that the 'protomeres' are the cause of the universal automatism of live matter and that they possess the power of metabolism, of assimilation and dissimilation, of increase in mass, and divisibility. They also possess individuality; they keep themselves alive

by metabolism; and they must be looked upon as a biochemical system which, on the basis of its structure, is able to undergo cleavage and division.

"Wilson, p. 431. In its physiological aspect, therefore, inheritance is the recurrence in successive generations of like forms of metabolism and this is effected through the transmission from generation to generation of a specific substance or idioplasm which we have seen reason to identify with chromatin. The validity of this conception is not affected by the form in which we conceive the morphological nature of the idioplasm—whether simply a mixture of chemical substances, as a microsome of invisible germs or 'pangens,' as assumed by DeVries, Weismann and Hertwig; as a storehouse of specific ferments as Driesch suggests; or as a complex molecular substance grouped in 'miscellæ,' as in Naegeli's theory.

"The contribution of Beijerink entitled: 'Uber ein Contagium vivum fluidum als Ursache der Fleckenrankheit der Tabaksblaetter' (Centralblatt fuer Bacteriologie, Abth. 11 Vol. V, 1899, p. 77) is not very often quoted, yet the vegetable disease he described represents the first morbid condition in which an invisible, filterable, ultramicroscopic virus was recognized and fully established as the etiological factor. Beijerink was not the first to study this vegetable disease—this was first done by Adolph Mayer in 1887, who established its contagious nature. In the same year Beijerink tried to demonstrate aerobic or anaerobic bacteria as the cause of the disease, but failed. Later he established the filterable nature of the virus; the explanation, however, in which he tries to give his observations is not at all correct.

"Hertwig, p. 339; 'Just as the plant or animal can be divided into milliards of elementary parts; viz., cells, so each cell is composed of numerous small hypothetical elementary particles.'

"We must also look upon the intercellular substances of multicellular organisms as true live sub-

stances, in other words, as composed of elementary biophoric granules. Virchow, when developing his cellular pathology and his dictum 'omnis cellula e cellula,' found something in the nature of a stumbling block in the intercellular substances of the body, and he then formed the conception that intercellular substance, as a mere product of cell activity possesses no true life itself, and was entirely depending in its nutritional activities upon the cells originally furnishing such substances by excretion, deposit, etc.

'M. Heidenhain protests against a conception of life of one structure which is only borrowed of some other structure and he very properly remarks that according to the true conception of life, live matter must be something always active, preserving its own structure by its own efforts or function, and not by the functions of another structure. Hence Heidenhain speaks of the automatism of life. Some of the intercellular substance of the body is, as we all know, composed of ordinary chemical matter, and this of course is not live substance. But wherever we find an intercellular substance, capable of true nutritional changes, we must be dealing with live, assimilating and reproducing ferment granules. This, of course, opens up an entirely new field and points out the fact that a large part of the body of multicellular beings is composed of live substance not present in the form of cells, but in the shape of elementary units existing in the body independently of the cell organization.

"If one views critically what has been heretofore taught about the nature of the enzymes, the so-called soluble, unorganized ferments, one is compelled to confess that those bodies, non-organized as they have been supposed to be, are chemical compounds which do not follow the elementary laws of physics and chemistry, bodies which are not bound and regulated in their action by the laws of the conservation and correlation of energy,

as laid down by Robert Mayer, Helmholtz and Joule.

"I will endeavor to show in this article, by a series of experiments conducted on a chemical and mainly on a bacteriological basis, that malt diatase and ptyalin are by no means unorganized dead bodies, but consist of exceedingly small round granules, which grow and multiply in the proper nutritive soils, not only in the grain of malt and in the alveolar secretory cells of the salivary glands, but also in artificial soils, kept in the incubator, and which form, in the presence of starch, dextrins and sugar as products of their metabolism.

"It has been taught heretofore that the action of the enzymes in general and the amylolytic action of diatase and ptyalin in special is to be looked upon as a catalytic process.

"By catalysis, contact, or cyclical action, is to be understood a class of chemical changes that are induced in certain chemical compounds or agents by a substance which does not itself undergo any permanent alteration, but whose presence under suitable conditions brings about a rearrangement among the molecules of the bodies with which it is placed in contact. The material acting in this manner without apparently being affected itself by the changes it induces, has been termed a catalytic or contact agent.

'We know a large number of catalytic processes, the purely nonanimated chemical nature of which is beyond any doubt at all. The conversion of saccharose (cane-sugar) by dilute acids into invert sugar (glucose levulose); the conversion of the glucosids by dilute acids into glucose and another body or bodies, depending upon the special glucosid; the process of converting starch into dextrin and sugar by dilute acids at high temperatures are examples of such catalytic processes.

"In the process of converting starch into dex-

trins and sugar through the medium of the catalytic action of dilute acids a great number of caloric units are needed to bring about this chemical change. In other words, we have a conversion of kinetic energy (heat) into potential energy which is stored up in the products (dextrin and sugar) of this catalytic process.

"On the other hand, if we convert starch into dextrins and sugar by the action of an amylolytic ferment latent heat becomes free or we have a conversion of potential energy into kinetic energy.

"From the facts collected from the writings of various investigators and from my own experiments reported in the first part of this paper, it appears that our conception, heretofore universally held, as to the dead unorganized nature of the enzymes cannot be sustained, unless we admit that those enzymes are bodies not bound as to their mode of action by the fundamental laws of physics and chemistry; more especially not bound by the laws of the conservation and correlation of energy. In the second part of my paper I have undertaken to furnish the experimental evidence that the enzymes malt diastase and ptyalin are made up of exceedingly minute round corpuscles multiplying under suitable conditions, not only in the grain of malt and in the alveolar secretory salivary cells, but also outside of their natural abode under suitable conditions, and producing in the presence of starch as products of their metabolism, dextrins and maltose.

"This experimental evidence was furnished by propagation experiments of such kind as we generally employed in bacteriological researches. In all these experiments the microscopic proof of the presence of the small ferment corpuscles, the size of which is very much inferior to that of any known microörganisms—was relegated to a secondary position, while the main evidence of the multiplication and propagation of these cells from generation to generation was furnished by

the chemical proof of the presence of the well-known fermentation products of diastatic action upon starch; i.e., dextrins and maltose.

"I have somewhere above expressed my belief in the identical nature of the diastase and ptyalin ferment corpuscles, a belief which in view of their identical chemical products under similar conditions seem to me to be fully justified. There are, however, some slight differences as to the action of the two enzymes diastase and ptyalin. The main difference is in the optimum temperature of their action, and there are probably also some slight differences as to favorable and inimical influences of some chemical agents increasing or hindering by their presence 'ceteris paribus,' the ferment action of the enzymes named, upon starch. These differences, I do not doubt, must be attributed to a variation in type between the ptyalin and diastase corpuscles. In view of the extreme minuteness of the ferment corpuscles, one is, of course, unable to state wherein this difference lies. Whatever may be the case, I think we have a right to assume that the ptyalin and the diastase corpuscles have a common progenitor, and that the differentiation manifesting itself in some slight distinguishing characters has been brought about in the course of time by the same factors that are responsible for the differentiation and development in the entire realm of organic life. If such a differentiation has been accomplished it is in itself a proof that those corpuscles, extremely minute and simple as they are, possess individual variability as well as any higher organism. It seems to me important to lay great stress upon this point.

"The above quotations demonstrate how keenly it has been felt that the cell could not be the ultimate morphological or physiological unit and that there must be something very much simpler than a cell, something possessing the powers of assimilation, growth, development, and multiplication.

"I am convinced, as stated before, that the ptyalin and diastase ferment corpuscles are a true type of the elementary corpuscles looked for; and if it be true as Pasteur claimed years ago, that every vital process is one of fermentation, then it is to be assumed that each and every one of the different species of elementary corpuscles is a ferment cell like the diastase and ptyalin cells with very definite fermentation products as the consequence of its metabolism. Under this assumption and with our knowledge of the influence of the accumulation of the fermentation products upon the further development and propagation of ferment organisms and enzymes, many phenomena of cell life heretofore observed but not clearly understood would be brought nearer to our conception.

"While the phenomena of heredity have forced such men as Darwin, Spencer, Naegeli, and others to assume the existence of minute corpuscles capable of multiplying in the cell, the demonstration of the existence of the character of such corpuscles as ferment corpuscles will bring many phenomena of heredity within the reach of a perfect understanding.

"I have already stated my belief that the ptyalin and diastase ferment granules possess individual variability and I have made some few experiments, not reported in this paper, which seem to indicate that the ptyalin ferment granules may be adapted to new optimum temperatures just as bacteria can be adapted in this manner. If this can be demonstrated satisfactorily, then there cannot be any doubt that the ferment granules do possess individual variability which, in the struggle for existence under altered conditions, must bring about the survival of the fittest and the fixation of a variety more or less different from its ancestral progenitors. This being the case we can understand why the ferment granules of one being should be, and must, to a certain degree, be different from the ferment granules of another being

of the same species, and as the germinal cells, respectively the ovum and the spermatozoa, derive their ferment granules from their parental organism or organisms, the fact that the offspring inherits the parental morphological and physiological properties even to the extent of characters of individual variability can be traced back to the difference in character of these ferment granules, acquired under varied conditions and fixed by the general laws of organic development.

"The question may be asked right here whether the ovum and the spermatozoa do possess all the ferment granules of the parental organism. If the ovum is to mature outside of the maternal organism such must be the case, lest the conditions of the existence of the embryo permit of the acquisition of certain ferment cells, necessary to its full development by symbiotic additions from the outside. If, however, the embryo matures in the maternal body there is no absolute necessity why the ovum should possess all ferment cells necessary to the organism postpartum. The embryo developing in the maternal organism may through the placental circulation be supplied with a number of species of ferment granules necessary to it in its after life, but not present in the ovum.

"We know that certain infectious diseases, such as small-pox, in the human race, may be transmifted intra utero from the mother to the offspring. And as Virchow has shown that all pathological processes have their physiological analoga, it is reasonable to assume that the intra uterine infection from mother to embryo, by a pathological ferment corpuscle, through the placental circulation, shows us what also occurs physiologically with reference to the ferment granules necessary to build up the complete mature embryo. As far as the ptyalin corpuscles are concerned there would be no difficulty in assuming this, since we know that a number of fluids of the animal body, among which is the blood of higher races, possess

slight diastatic properties doubtless depending upon the presence of ptyalin granules."

All of the foregoing paragraphs, in this chapter, are expressions of opinions which may seem unimportant, to some, relative to our subject, but when considered in the light of coming events, which will surely follow,—those inventions and discoveries of the future generations—they are indeed important; they give to us the courage necessary, when delving into new fields of work whose virgin soils have been unmolested and undisturbed in their existence of seemingly quiet innocence and apparent defiance of investigation.

In the above work (by Dr. Herzog) may be seen,—only a few pages being taken from the monograph; a research work on Endocrinology, begun about thirty years ago, by a seeker after truth who is now dead and apparently forgotten—the epic of a quiet and studious man, who by the vastness of his vision and tendency towards a creative genius, stood in his day among even the most brilliant of minds.

The child is excellent raw material for the making of the scientist. First of all, he is curiosity incarnate; he does not confine his attentions to those matters which adults consider practical, but tries to learn all he can about an environment which he finds brimming with interest. Moreover, he is an experimentalist, and the days are too short for the experiments he wishes to perform upon everything at hand, from the bric-a-brac to the patience of his elders. He relies upon experiment rather than upon authority for learning the truth. Authoritative representations concerning the fra-

gile quality of glass, the taste of pepper or the temptations of a stove to him are but suggestions for experiments. Although his experimental technique is simple, and his capacity for reasoning and theorizing undeveloped, he has made a splendid beginning towards a scientific career. At the age of seven he will ask: "Papa, who hangs the 'moon' out every night," and, "Mamma, where did our new baby come from," and—when seeing a cemetery and having been informed that the many tombstones signify that some one lies buried there—"Where do people go when they die?" In his further development, however, he meets with opposition at every turn. Many of his experiments earn punishment from his parents, who discourage his curiosity and even pervert the truth for their own ends. At school, book-learning is substituted for observation and experiment, and even when the topic is nature or science, it is often taught in a very didactic way by a teacher who,—though having taken many courses in pedagogy—may have but little appreciation of the spirit and method of science. At Sunday school he is likely to find a teacher who praises as religious virtue the docile acceptance of dogmatic authority and to whom the term "doubt" is one of opprobrium. The repressive progress, alas does not end here, for we in the university who next take him in hand delight in giving him the impression that the subject has been thoroughly elucidated. We take little pains to help him to realize the existence of vast fields awaiting exploration.

CONCLUSIONS

THE SUMMARY
OF
CONVICTIONS FROM INFERENCE

> "It matters not how a man dies, but how he lives"—and—"As a man advances in life, he gets what is better than admiration,—judgment, to estimate things at their true value."
>
> —*Dr. Johnson.*

IN the concise deductions which follow we will find much evidence resembling a vast mass of foliage in a great forest supported by giant tree-trunks; this is the inevitable subsequent growth, in the actual triumphs and defeats of man in his study of medicine,—it does not represent, however, the thoughts, the voice, and the work of any one man, nor the teaching of the mugwump or bigot or other bias natures—it truly represents our only protection to man during his illness, which has the substantial characteristics of honest endeavor from a practical and scientific view, and is truly the result of the work of many men of many minds, and rests on the firm basis of several hundred years of study; first, the classical and literary or academic teachings; second, the practical experience at the bedside in the home and hospital; third,

the technical and research work in the laboratory.

In our every day walk of life, as we associate with our fellow men, we are impressed by the fact that no two individuals are just exactly alike. The more we travel over the face of mother earth, the more we come to realize the truth, that all men differ greatly in their make-up, including first, the face, stature, contour, and complexion; second, the predisposition and individual disposition to disease, or in other words, hereditary or acquired immunities and susceptibilities in health and disease during life; third, the qualifications possessed by every individual to a marked degree, known as, courage, or cowardice, violent temper or pensive calm, a worker and builder, or a sluggard and destroyer; fourth, those natural or acquired traits of the unfortunates who eventually become the common thief, the money counterfeiter, the forger and other types of so-called crooks; fifth, the personalities or individualities of those who become great leaders of men, in times of peace, as well as in times of war, captains of industry and commerce, artists and artisans such as, painters, sculptors, singers, actors, and expert mechanicians; also physicians and surgeons, attorneys, orators and others.

It is impossible to say just what part the mental, physical and educational qualifications play in any of the above specified individuals. We know that many men who have been honored,—presidents of countries and others who have attained high positions in life,—have spent the greater part of their lives on the farm. Great singers and other artists have originally come from

among the peasant life or from poor families who lived in poverty, perhaps in the crowded quarters of a great city. We know the great Napoleon Bonaparte was handicapped in the beginning of life, he was poor in cash, with no property, real or personal, not of royal blood, nor of a great family; had little education, with no inclination to learn in youth, was not a giant of physical strength and yet according to history, no man has succeeded him (in accomplishment) up-to-date, inasmuch, that nowhere do we find a similar record equal to that of the little Corsican; where a man has accomplished great tasks under extraordinary circumstances and the existing conditions of the times. In this respect, it would be well to reflect upon the fact that many of the men who have been elected to the office of President of the great United States and commander-in-chief of the Army and Navy of an undefeated country, have been self-educated and self-made men.

Surely there must be "something," far beyond the recognition (by the mental capacity) of man, (it is quite possible that this "something" is contained in the so-called "regulators of mankind," so-called by the scientific men of today) which controls the several characteristics of every individual; for instance, why should one individual have bright red hair, another jet black hair, another, golden hair? The same question may be asked relative to the color of the eyes of the human; and, why have we five distinctly different races of man, with skins of different color? In every instance the "race" of the individual must be taken into consideration when we "think" in terms

of "social welfare," or "act," in way of purpose "physically," relative to the "susceptibility" and "immunity" to disease; these qualitative virtues being possessed by the individual or absent, as the case may be, and in accordance with the nature and characteristics of the individual, as well as the "race." It is true we have the "law of heredity" but, what great unseen power or empire was the original "appropriator by aggregation" which now "dominates" this law; by first, gathering together these several characteristics (of a father, a mother, or one of their relatives); and second, the arrangement of these characteristics in order, so that each may carry out its own instructions, without infringement on or interference with the others, in the performance of its function; third, the process of accumulation, of all these characteristics, in so minute a thing as possessed by a microscopic animalcule (in the spermatozoa, the ovum, or both), which eventually culminate in the production of the new-born. This power or empire of domination must hold true in all nature's handiwork throughout all organic life.

It must be understood by the reader that in the few pages which follow, containing the conclusions, it was necessary that the several subjects involved be concisely treated and reasonably epitomical in character, as each subject truly represents hundreds of years of study and thousands of written works, and therefore a difficult matter to clearly explain in just a few words.

CHAPTER XIV

CONCLUSIONS TO PART ONE

> "A child should not be discouraged from reading anything that he takes a liking to, from a notion that it is above his reach. If that be the case, the child will soon find it out, and desist."
>
> —*Dr. Johnson.*

BIOLOGICAL PHYSIOLOGY:—

Of all our studies relative to the actual existence of material things, together with their true nature and worth,—especially "man" and his contemporaries, the necessary environments and constant associations—the subjects, Biology and Physiology, are perhaps of primary importance; their far reaching ramifications into allied subjects and the fact that they involve, in their ramose nature the fundamental essentials of life and function, each dependent upon the other and the knowledge which demonstrates the impossibility of one existing without the other, give us reason to assign to them a place of great significance and much consequence.

The biological term, "Biogenesis," (being a combination from the Greek words, meaning life, generation, birth) is used to demonstrate the theory that, each living organism, no matter how simple or great, arises by a process of either budding, fission, spore-formation or sexual reproduction from a parent organism. There is no biologi-

cal generalization which rests upon any wider series of observations, or has been subjected to a more critical scrutiny than that which proves that every living organism has come into existence from a living portion, portions or parts of a pre-existing organism. It is within common observation that parent and offspring are (more or less, sometimes to a marked degree) much alike; the new organism resembling that from which it has come into existence, in some form or another; every organism taking origin from a parent organism of the same kind. The normal life-cycle of both plants and animals exhibits what is known as alternation of generations, so that any individual in the chain may resemble its grand-parent and its grand-child, and at the same time, differ markedly from its parent and child. As a contrast to the above, it may be said, that there have been (from time to time) some observers who contend and maintain a belief in an opposite theory, to which the name "heterogenesis" has been given; according to the theory, the offspring of a given organism may be utterly different from itself so that a known animal may give rise to another known animal of a different race, species, genus, or even family, to a plant, or vice versa. No serious observer, acquainted with the modern technical methods, in microscopy and research work, has been able to confirm the explanation of these observations as given by the few believers in the "heterogenesis" theory.

The biological sciences are those which deal with the phenomena manifested by living matters; and though it is customary and convenient to group

apart such of these phenomena as are termed mental, and such of them as are exhibited by men in society, under the heads of psychology and sociology, yet it must be allowed that no natural boundary separates the subject matter of the latter sciences from that of biology. Psychology is inseparably linked with physiology; and the phases of social life exhibited by animals other than man, which sometimes curiously foreshadow human policy, fall strictly within the province of the biologist.

It may therefore be seen that "life" is the apparent "activity peculiar to protoplasm," this "activity" being known as "physiology" of the organism, be it of the so-called unit or composite type. Physiology deals specifically with function, including its properties and processes; but the unknown "stimuli" which produce primarily either the "protoplasm" that takes on secondarily its "function," or the unknown "stimuli" which produce primarily the "function" that creates secondarily the "protoplasm," are the enigmatical phenomena, pertaining to the origin of "life." Therefore, it is quite plain that we cannot discuss adequately the origin of "life" or the construction of living matter (its initial source of properties and processes) until the chemistry of the "protoplasm" and especially of the proteids is more advanced. A living organism usually displays an active metabolism of proteids (perhaps other properties and processes); this metabolism may slow down, at times actually cease, and yet reawaken; a dead organism is one in which the metabolism has ceased and cannot or does not reawaken. The

categories, "alive" and "dead" are not sufficiently distinct for us to add to our present conception of "life" by comparing them. The "laws of nature" which are not only imperative to the human understanding, but also essential to the physical well-being and which must, therefore, receive due recognition, are as follows:

First, all living things, be they of the animal or vegetable kingdom, are by natural consequences victims of their environment, to a greater or lesser extent; it little matters should they live in the air above us, in the water or earth beneath us, or on the earth's surface with us. All are governed by certain factors pertaining to its nature, the primary factor being "the survival of the fittest," and all things that do not measure up to this requirement must either degenerate or become extinct. The next factor in order would seem to be the "conformation to accommodation," in which all living things have a tendency to acclimate themselves to any and all conditions. As a consequence of these two factors, a third factor, "the process of evolution" plays its part, wherein are found the change of living things, in size, color, form and character.

Second, all reproduction of life is the result of cell multiplication, through a process of cell-formation or cell-division; there being two methods, one known as mitosis, karyokinesis or indirect cell-division generally found in the human, the other being known as amomitosis or direct cell-division which is confined mostly to the lower animals. The important factors in cell-division consist of chromatin, chromosomes, poles, spindles, skeins and diasters, involved in their sev-

eral stages, to-wit: the increase of chromatin to make chromosomes, followed by chromosome-splitting; then convolution and aggregation of poles, spindles and skeins, followed by cleavage and migration of the segments, terminating in the formation of double diasters, with the ultimate production of another cell.

As a consequence of these "laws of nature," and when we consider "biogenesis" (the doctrine that life is generated from living things or beings only) and then "bionomy" (the science of the laws of living functions), also "biology" (the study of life or living organisms), as compared with the "biochemical" and "physio-chemical" basis of physiological process, the question arises, are these so-called "granules" or "minute bodies" truly "alive," or do they merely control the life producing phenomena by a far-reaching and many-angled secret power of primary "amalgamation," with a secondary "fission" and a tertiary "fusion?" It is now generally accepted as actual facts that: first, these "granules" (known as microsomes or chromatin), are really contained within all cell life; second, that cell life is essential to make up all organs; third, that many organs are necessary in the constitution of a normal human being.

BACTERIOLOGY:—

The conclusive evidence of the actual existence of bacterial life—disease producing and non-disease producing forms—may be stated in these indisputable terms which follow, being accepted as authentic, by all institutions of learning the world over. Up-to-date no contradictions or contentions of these facts have come to light. About the year

of 1865, Pasteur proved the inconsistency of the spontaneous generation theory; about the same time and later, other scientific men proved to the world and their own satisfaction that the spontaneous generation theory was a myth, and the question was settled for all time; between the years of 1876 and 1882, Robert Koch added much to this study.

While there are many reasons to believe that the theory of microörganisms existed in the mind of man, even before the year of our "Lord," the science of "Bacteriology" did not make much progress until after the year of 1885; then it went forward in leaps and bounds. The all important point of this study is to show and prove beyond a doubt, how these bacteria cause disease and produce pathological conditions. This has been done. Many men have contributed to this work, but to Pasteur and Robert Koch, whose fundamental work on the studies of pathogenic microörganisms in general and some disease producing types of bacteria in particular, the science owes much. Today "Bacteriology" has assumed a place of great importance and receives much consideration in the general practice of medicine.

In the question of the non-pathological, the pathological, and the normal or essential microorganisms, under the study of bacteriology, there are many preliminary points to be mentioned. First, some form or other of bacteria are found, on land or in water, in all parts of the world; therefore we say, bacteria are ubiquitous which means everywhere because they are found in soil, water, air, and on plants and animals, alive or

dead. (It may be truthfully said, wherever we find organic matter we find some form of bacteria.) Second, there are now recognized three principal groups of bacteria; some of which are harmless and apparently non-essential; some of which are harmless and essential to life; and some of which are disease producing, therefore, detrimental and non-essential to life.

We do not know where or when the first arrivals of the bacterial family happened along, they do exist and they are here, that we know, therefore, we must make the best of the situation and vie with their existence. Today we say, Bacteria are unicellular and asexual in nature. It is quite possible that the future in its scientific research may change this and revise both the terms, unicellular and asexual. In justice of entering this broad statement, let it be understood; in most all bacteria we find a large amount of microscopic "granules" or "minute bodies," which seem to play a part in the reproduction process, but just what are the functions of these "granules" or "minute bodies" we are at a loss to determine at the present day. It is quite possible that these "granules" may prove to be of some significance relative to the hormones, enzymes or ferments contained in the internal secretions of the ductless glands. In other words, science may bring forth in the future a new study, in which it will be found, first, that bacteria are reproduced by a process of absorption or osmosis, the mode of procedure being something on the following order: a primary change produced in the "granules" of cell-life (microsomes or chromatins) in the different or-

gans of the human, by the antagonistic chemical substance contained in the "granules" of the invading bacteria (when any infection takes place), when these two primary factors or elements are brought in contact with each other, the "granules" of the cell being appropriated after this change takes place, by the bacteria; second, through some unknown process, yet to be discovered, the "granules" produced in the different glands of the body and carried by the internal secretions in to the blood-stream, may be the supremely eminent power or predominant factor, in the bringing about of this primary change; a possible relation to the factors of "immunity and susceptibility."

We have said that bacteria are ubiquitous (found everywhere). A little study of the subject, Bacteriology, will perhaps remind us of an all-powerful and unavoidable means of meting out a just punishment for our several so-called sins or social misconduct. We may evade the law of man, but the law of nature never. It is quite possible that these insignificant microörganisms will play their part of domination in the life of man until the arrival of the time when all men will admit the superiority of bacteria and the inferiority of man. Then all men as a unit will strive to conquer Bacteria. When civilization has reached that stage where it can devise the ways and means to eliminate or control these microorganisms it will surely be the one great achievement which will make for the amelioration of nearly all disease or pathology. In other words, there are those people who will "pooh-pooh" the idea that microörganisms are disease-producing-

factors. In these cases the different types of micro-organisms are permitted to continue their destructive processes, from the different angles, thereby getting the upper-hand. As a consequence, every now and then, we have practical demonstrations of man's inferiority to cope with the army of invasion in its aggressive onslaught of humanity, manifesting the evident superiority of certain types of bacteria in the form of epidemics. When the human family, the world over, comes to know and will recognize the true significance of the part played by microörganisms in the production of disease, then, and only then, can we expect to make any efficient steps towards the conquering of man's great enemy, disease.

PATHOLOGY:—

It must be understood at the beginning of our conclusion that, disease is not a thing of a spontaneous or instantaneous nature, but a process which may be localized or general in the system of the human being and always resulting from various causes, many of which are known and some unknown to medical science. It is the consensus of opinion by most recognized authorities, on the subjects of physiology, bacteriology and pathology, that it is almost impossible to draw a hard and fast line between any of the three subjects, for instance, it is a difficult matter to say in any disease which is caused by an infection or other processes, just where the physical function ends and where the pathogenic or production of disease process begins. Hence, we have today, the much advocated "preventive medicine treatment"

which virtually means, to seek and find if possible, all disease in its infancy or at its very beginning and prevent its continuance or spreading, thereby avoiding the possibility of involving any entire organ or, perhaps, the whole human system of body, and incidentally this would aid materially in the checking of epidemics in their various forms and degrees. It would seem then, that a prerequisite of the successful study of pathology (the science which treats of disease) would necessarily depend to a great extent, upon a comprehensive knowledge of normal anatomy and normal physiology, together with physiological chemistry and bacteriology, these studies would consequently take into consideration, "Endocrinology." As medical science has conquered to a great extent such diseases as small-pox, lock-jaw, diphtheria and typhoid fever, so must it continue to combat all other ailments of the human family.

The term "pathology," by itself is usually applied to humans, animals and plant-life; it is from the Greek word, suffering, and is accepted generally as meaning, the science dealing with the theory of causation or nature of disease processes. Progress in the study of "pathology" has been greatly facilitated by the introduction, in recent years, of the many improved methods of technique. The complexity and mystery of action, inherent in living matter, have, probably, been accountable for much of the vague philosophy of disease in the past, and have furnished one reason at least why "pathology" has been so long in asserting its independence as a science. The eloquence of fact appeals to the scientific mind of today

much more than the mere assertion of the crude and unproven principles of yesterday.

As a consequence of the admission, by all the leading institutions of learning in the world, that "pathology" is the science of disease in all its manifestations, whether structural or functional, progressive or regressive, local or general, bacterial or chemical, we may add: since "pathology" is the science of disease, we are met at the very threshold by the question: What is disease? This may best be answered by defining what we understand by health. What do we mean when we talk of a healthy organism or an individual? Our ideas on the subject are purely arbitrary, and depend upon our everyday experience. Health is simply that condition of "structure and function" which, on examination of a sufficient number of examples, we find to be commonest. The term in fact, has the same significance as "the normal." Disease we may define, accordingly, as "any departure" from the "normal standard" of "structure or function" of a "tissue or organ" and consequently, the "individual."

In times past it has been the habit to look upon such subjects as, anatomy, physiology, bacteriology and pathology, as something tagged on to the "treatment" of human disease, but unworthy of being studied independently as branches of knowledge. Such a view can recommend itself to only the narrowest of minds.

We now know that our forefathers, if one may venture to criticize their earnest endeavors, were indeed too impatient, and were greatly handicapped by the lack of knowledge. Influenced as

they were by the prevailing philosophy of their day, they endeavored from time to time to interpret and reduce the study of disease to philosophical order when the very elements of philosophical order were wanting. Those who study the subject of pathology have come to realize that they must labor and await developments; it is largely to these measures and researches that we owe much, relative to our present knowledge.

IMMUNITY AND SUSCEPTIBILITY:—

Many years ago there appeared a powerful factor in the life of man. It became quite evident that man must use every effort to free himself of all disease and that his general physical condition be kept in a normal state of good health. This is necessary to his progress and success in every-day life. As man's intelligence has evolved through years of experience and experiments, also have the methods in treatment of disease undergone a corresponding evolution in the practice of medicine and surgery. In connection with this subject the author will venture a bold prediction, to-wit: all future study of "Immunity and Susceptibility" will eventually hinge, secondarily, upon the properties of the contents of the blood-stream, and, primarily, upon the component factors which produce these contents, containing therein the lack of or a goodly supply of the properties of either, a good "Immunity" against disease or a "Susceptibility" to acquire any disease condition. This will hold true not only from a pathological standpoint, but includes all the actual relations of the characters in the offspring to the

characters of the parents and ancestors. In this broad sense there is no character that is not transmissible. These are being collected and grouped as follows: character of class, family, genus, species, race, and of the actual individual; incorporated therein are found, in many instances, the transmitted anatomical or physiological characters down to the most minute detail, as well as such phenomena as diatheses (a congenital or acquired predisposition to any particular or special disease), gaucherie (awkwardness or clumsiness), and psychological (good, poor or depraved mentality); also the teratological (abnormal growths, deformities, monstrosities), in minor cases of syndactylism (fused toes or fingers, so-called webbed fingers or webbed foot), and extreme cases of individual variations.

The term, Heredity, its full meaning and wide scope, surely covers a vast field of contentions and complexities, involving the many pros and cons of argument. However, from the medical standpoint, heredity may be defined as the transmission of physical or mental qualities, including susceptibilities and immunities in health and disease, from parent to offspring, or the tendency manifested by any organism in the human body, in part or as a whole, on the part of any individual, to develop, in the likeness of a progenitor. Observation demonstrates—as a rule, in accordance with the several laws of mankind and his several stages of developmental progress morally, physically and mentally to-wit: the hereditary tendencies law, the survival of the fittest law, and the self-preservation law during "actual life" as well as the unknown

law or power which produces the desire to reproduce our kind, preserving life in its beginning even before "actual life" takes place as an individual, in our outer world of life; the natural organic "tendency law" of life or the preëminent "law of disposition" to preserve life in its predestination, —that there is very little blemish in nature, except as a result of ignorance on the part of man or from the perverted thinking of the abnormal mental capacity of the human mind. Therefore, it may be said, through the ages of the past, there has been handed down, unknowingly, from father to son, much disease due to ignorance and perversion.

In the branch of bionomics, however, concerned with the laws of variation and heredity—the study known as thrematology—there has been considerable progress. In the first place, the continued study of human population has thrown additional light on some of the questions involved, whilst the progress of microscopical research has given us a clear foundation as to the structural facts connected with the origin of the egg-cell (ovum) and the sperm-cell (spermatozoa) and the general fundamentals of fertilization and reproduction.

As to the importance of the transmission of disease from parent to the offspring, it is known that at least three sets of factors may operate and should be taken into account as follows: first, a child may inherit the anatomical and physiological constitution of either parent, and with that a special liability of failure to resist the attacks of a wide spread disease; second, the actual fundamentals of detrimental bacteria may be contained

in the ovum or possibly in the spermatozoa, or the actual attack of certain microörganisms may have effected or affected these elements materially; third, any one of the several toxins as found in disease (in the parent) may have affected either the spermatozoa or the ovum in the first instance (before conception takes place), or in the second instance may affect the child, any time after conception, through the blood-stream of the mother.

When we speak of the immunity from a disease, or the susceptibility to a disease, and the relation of the individual to any kind of an infectious disease, and then apply either of these prevailing conditions or peculiarities to the existing circumstances or conditions, known as, the attenuation or virulency of an infection which prevails at all times among the different forms of bacteria, thereby bringing together the intimate relation of these terms or conditions and their practical worth, it can be best explained as follows:

Mr. A. B. catches a "cold" and goes about his business as usual (it is a touch of pneumonia, but he does not know it) he being one of the individuals who has a good immunity but is not aware of the fact, the infection (the attenuation not being extremely low nor the virulency exceedingly high) is one of the mediocre variety. A. B. feels badly for a few days but takes good care of himself, by doing as little work as possible, thereby resting himself physically and mentally and by eating very little, but of nourishing food, he also rests the internal viscera; this method of avoiding all mental, muscular and visceral fatigue is in his favor; about the fourth day he remains home and

calls a doctor who informs him he has a mild attack of pneumonia. In a few weeks A. B. is well again and a month later is himself again.

Here we must mention an important factor which generally plays a part in this kind of cases. Mr. A. B. is, as a rule, of the following type; a medium sized man who always enjoys good health, yet to all appearances he is not a Hercules nor what one would call the picture of robust health; this type of individual and his ability to enjoy good health throughout life, is due no doubt to the fact that he has always had a good immunity (natural immunity) and to the additional fact that he has always used good judgment, taking care of his health by avoiding all excessive pleasures and with no tendency toward dissipation. It will be noticed that, as a rule, those individuals who have, what might be termed, a general good immunity, have also, as a rule, a general good physical and mental capacity which lends to the exercising of good judgment in the way of right thinking and living, therefore tends as a whole to maintain a general good health; all seem to run hand in hand, as a cycle within a cycle (this type of individual, should he take up "Christian Science," makes the ideal convert).

We now return to our explanation. While Mr. A. B. was ill or had his "cold" and went about his business the first few days, he unknowingly transmitted it to Mr. C. D. who happens to be of the same type, character and calibre as A. B., and C. D. goes through or has practically the same experience as A. B. has had. While C. D. is going about his business the first few days of his illness,

he unknowingly transmits it to E. F. and E. F. happens to be of the same type and character as A. B. and C. D.; so E. F. has practically the same experience as A. B. and C. D.

If the same physician had attended all three of these patients he would have noticed that A. B. was really a sick man during his illness and that C. D. was not quite so sick as A. B. and that E. F. was not so badly off as either A. B. or C. D. and at no time of his (E. F.) illness was he in any great danger. This is explained by the fact that each one (A. B., C. D. and E. F.) having had a good immunity and therefore good resisting powers to this particular disease has during his illness lowered the virulency of the microörganisms (which caused the disease) and if any (one or more) individuals had contracted the infection from E. F. the microörganisms, in this particular instance, were so attenuated that those individuals, who contracted the infection from E. F. complained only of a bad "cold," and none were so bad that it became necessary to consult a physician or go to bed. So is it demonstrated, the relation of the attenuation of microörganisms plays an important part in the immunity or the resistance to disease, or any bacterial infection.

Again we may say (in a demonstration, as viewed from another angle, on the same subject) Mrs. X. Y. who has, unknowingly, no immunity but on the contrary a susceptibility to this same disease (pneumonia) and after contracting this infection in the same manner, a bad "cold," becomes very ill. While Mrs. X. Y. is sick with the "cold" a friend, Mrs. W. pays her a visit and contracts the

disease; Mrs. W., after going through the preliminary stages becomes very ill and while ill, her friend, Mrs. J. T., calls on Mrs. W. and Mrs. J. T. contracts the disease and becomes very ill. In these cases all three may die or Mrs. X. Y. may recover, but Mrs. W. and Mrs. J. T. usually become seriously ill and extremely low, if they recover at all; as a rule both (Mrs. W. and Mrs. J. T.) die. In this kind of cases the poor resistance or the lack of immunity on the part of the individual, increases the virulency of the microörganism and after this microörganism has passed through three or four stages of this tendency to increase its virulence, all who contract this infection, at this time, either die or are hit very hard by the infection, and only those survive who have either, in the first instance, a "natural immunity" or in the second instance, the faculty of responding to a treatment which will give immunity. This group of microörganisms will continue to do great harm and cause many deaths until it meets and passes through several stages of the attenuating process, by infecting several individuals with exceptionally strong resisting power or very good immunities; as shown in the above hypothetical cases of Mr. A. B. and C. D. and E. F. It must be understood that other idiosyncracies, as well as infections by microörganisms, play their own peculiar parts, in all states of immunity and susceptibility, of every individual, in all conditions of disease. Here we have, to a marked degree, the explanation of the cause of epidemics, endemics and pandemics of disease; that is to say, how they begin or get started, and to stem the tide of spread, good medi-

cal attention is of importance, to the extent of aiding each individual in the building up of an immunity.

METABOLISM:—

For practical purposes, the food and nutrition of man in health and disease, may be defined as that which, when taken into the body, may be utilized for the formation and repair of body tissue, and the production of energy. More specifically, food meets the requirements of the body in several ways. It is used for the formations of the tissues, the fluids of the body, and for the restoration of losses of substance due to bodily activity. The edible material is by no means a simple substance, but consists mainly of water, and some or all of the compounds variously designated as food-stuffs, containing nutritive ingredients or nutrients, together with the approximate principles of their preparation, all of which are classified as proteins, fats, carbohydrates and mineral-matters, and all having various functions in the nourishment of the body.

All branches of science agree relative to the recognition of the following: in all living matter there is a constant cycle of chemical changes going on, a constant breaking down (catabolism), and a correspondingly constant building up (anabolism). Unless the former is covered by the latter, wasting and finally death must supervene. These two changes together make up the "metabolism," and the study of this involves a study of the fate of the food absorbed both when it is used immediately and after it has been stored in the tissues of the body.

With a little knowledge of the so-called carbohydrates, proteids and fats, their actual necessity in the sustenance of life in the human, of the right kind in quality and in proper amounts, any one of sane mind does not necessarily have to stretch the imagination very much nor draw upon the natural intuition to the extent of the breaking point, to visualize an individual case wherein are found any of the following; a condition of "perverted function" or evidence of the loss of the "physiologic equilibrium" or symptoms of "faulty metabolism;" all of which are more or less synonymous terms and mean "interference with" or "disorder of" the "constructive and destructive process," as well as the "reconstructive and secondary destructive mechanism," and the consequent redistribution of nutritive substances and the elimination of waste materials, in the system of the human economy.

Elimination of waste-products is no doubt one of the most important points in regard to good health, and when this in interfered with by disease of the kidneys, the life of the patient is rendered more or less uncertain and the health frequently seriously impaired; this is also true relative to all elimination channels such as the skin and alimentary canal. In any case of altered function or any disease process, the intake and output of all food has an important part, sometimes reducing the quantity of one kind of food to a minimum is beneficial or essential, sometimes the patient is kept on an entirely liquid diet.

Akin to this subject may be mentioned the term generally used to include all conditions in which

the normal temperature of the animal body is markedly exceeded for any length of time, the so-called fever. Every rise of temperature is due to a disturbance in the heat-regulating mechanism. When the temperature is sufficiently elevated (of a fever), the heat has itself an injurious action on the protoplasm, and tends to increase disintegration just as when heat elimination is experimentally retarded. In any pathological condition, the heat-regulating mechanism may be disturbed in three different ways; first, by mechanical interference with the nervous system; second, by interference with heat elimination; third, by the action of various toxins or poisons, of a bacterial or chemical nature. In the beginning of a fever the activity of the metabolism is not increased to any marked extent, and any increase is necessarily largely due to the greater activity of the muscles of the heart and respiratory mechanism, and to the muscular contractions which produce the initial rigors. Thus the excretion of carbon dioxide—the great measure of the activity of metabolism—is not usually increased, and there is no evidence of an increased combustion. In the later stages the increased temperature may bring about a change.

There are limits of both heat and cold that a warm-blooded animal can bear, and other far wider limits that a cold-blooded animal may endure and yet live. The effect of too extreme a cold is to lessen metabolism, and hence to lessen the production of heat. Both catabolic and anabolic changes share in the depression, and though less energy is used up, still less energy is generated. This diminished metabolism tells first in the

central nervous system, especially the brain and those parts concerned in consciousness. Both heart-beat and respiration become diminished in numbers, drowsiness supervenes, becoming steadily deeper until it passes into the sleep of death.

CHAPTER XV

CONCLUSIONS TO PART TWO

> "Every man has a physical right to think as he pleases, for it cannot be discovered how he thinks. But, sir, no member of a society has a right to teach any doctrine contrary to what the society holds to be true."
>
> —*Dr. Johnson.*

THE GLAND OPERATION:—

ONE of the old Greek philosophers said, "The first moment which gives us birth, begins to take life from us." There is much logical significance in these words. Science is demonstrating this as a matter of fact, more and more every day. From the day we are born there begins a slow but positive and never ending process of construction and destruction of individual organs of the human being, which continues with a more or less accelerated action, taking place at different periods of life, depending upon the ability of the individual, to stem the tide of action by good and right living, thereby reducing to a minimum, in many instances, this destructive action process, retaining good health and warding off disease and old age, living and enjoying life, until we are eighty or ninety years of age or older. When we cannot or do not conform to the above, but live fast, many years in one; we speed up the action of this destructive process, resulting in loss of youth, invalidism or early death. It must be understood, that

the above statement does not apparently hold true as a whole;—in other words, the average normal individual (after eliminating hereditary or actual active disease processes) does not have destructive changes take place in every organ in the body at one and the same time, from the moment he or she is born—but each of our organs takes its turn, while we grow, from infancy to youth, from youth to manhood or womanhood and on to old age, resulting in an atrophy, shrinking, or worn out condition, any of which may be termed a "destructive process," until finally the entire structure gives way under the pressure of use and exertion of a life time. All of this may be responsible for the statement, "the starting of life is the beginning of death."

In the so-called "interstitial gland transplantation operation," there are a great many direct facts bearing on the subject, which we know to be correct and true. These have been explained to the best of our knowledge. There is, however, a great deal more to be learned relative to the indirect or apparent facts bearing on the subject; these we do not know to be correct and true, but we do know from the anatomical and physiological relations of all these glands that these indirect or apparent facts, as well as the direct or known facts, must be at all times remembered and given full consideration from every angle and viewpoint. The direct facts come to us from those ductless glands (the endocrine group as a whole) some of which we now know to be actually involved in the process of internal secretions and containing therein the ("minute bodies" or "gran-

ules") so-called "Hormones." The indirect facts are the apparent evidence (which at times manifest themselves) involving the possibilities of association, amalgamation and co-ordination of these interstitial glands (and their internal secretions containing its hormones) with one or several or all of the other glands as known (and those at present unknown) in the chain of ductless and possibly other glands, found in the human. The big question here is, what is the one important thing connecting the interstitial glands or other products, with these other endocrine glands or—what are the many materially essential factors, necessary in these other endocrine glands which in all probability have an influence, primarily, on the function of the interstitial glands or gonads, and secondarily on the "products" of these (gonads) glands? In other words, what are the set of laws relative to these reproductive glands (the gonads and their secretions) and what system of rules or regulations are recognized by these glands (or the other glands in this group) and applied in nature's laws and how are we to define them;—it being understood that, late discoveries in recent medical research work has demonstrated the presence, in the gonads (as well as in other organs), of antagonistic principles or factors (to some of the other glands or at times, to the normal functions of the other endocrine glands; these antagonistic principles or factors being, the possible "negative phase" of the "minute bodies" or "granules" or "hormones," the so-called "inhibitors" or the elements which may possibly cause a "contrary action" working in an opposite direction or in an opposing manner, to

the harmonizing substances, and known as the "inhibitory action") as well as harmonizing substances or principles or factors—all being governed, apparently, by this unknown law or the chemo-physiologic process, within the laws of biology or nature. Herein, no doubt, will be found the solution to the "starting of life," and "maintenance of youth and vigor," and the "beginning of the end, death."

ORGAN TRANSPLANTATION:—

As to the transplantation of any and all human organs or organisms (including the gland transplantation operation)—the ways and means of introducing into the living human body, any organ or organism from any other living body, no matter from what source obtained, with the expectation that it will function, unaltered and normal, in its new environment—that process is far beyond all the powers of man's ingenuity of today and remains to be revealed unto man of the future through research and science. There is much bone implantation work being done and some muscle tissue being transplanted, in the human of today, but even in these cases, the methods are far from perfection and the results not always the best. Skin grafting or transplanting has proved to be our most successful operation.

A weekly Journal, devoted to the Advancement of Science, publishing the official notices and proceedings of the "American Association for the Advancement of Science," in the issue of January 12, 1923, under the heading of "Interesting developments in science during the past year have oc-

curred in various fields of organized knowledge," had this much to say relative to gland operation. "The use of glands and their aid in rejuvenation was the subject of experiment and discussion." This appeared under a sub-heading "medicine." The few words in this short report are concise and non-committal but are significant in their meaning; it is therefore self-evident that nothing of a material nature has been accomplished in this field, at least to date.

While it may not seem so, it is never-the-less a fact that we must consider the blood stream as the most important factor together with the blood vessels, because the blood vessels are necessary to carry the blood, arterial, venous and lymph, in which are contained the hormones of the internal secretions. This may not appeal to the average individual as correct, but suppose we take this view of the matter. When a man wants to build a house the first thing he will do is to go to an architect to tell him in a general way the kind and style of house he wants. Then the man will look for a place to build the house, if he has not already selected a location. When the plans are drawn and approved, the house is put up and finished and the man moves into the house to live, and that ends the whole affair. At no time, even from the beginning, did that man give—for one moment—any thought to the most important part of the building of that house. He never said to himself, where is the material coming from, to build this house. Circumstances are such, at the present time, that we do not have to pay any attention to this part of the matter, at the same time the mate-

rial still remains the most important thing, for the simple reason, that without the material there would be no house of wood, brick, stone or any other kind constructed, yet these things were given little or no consideration. We are not now speaking of the construction of the house, but of the value of the importance of specific material for specific purposes, which is paramount to all other consideration. So while most of us would not think so, the blood stream is of great importance, first, as a common carrier, and second, because we see in all the ductless glands the especially large blood supply (the so-called "gross vascularity") and third, the intimate relation of all the glands is made possible by the avenue of the blood stream. Taking the above into consideration it will eliminate all possibilities of our success in all transplantation operations as done by the present day methods, because there will not be any anastimosis, meaning, a joining together end to end of arteries or veins in such a way that the blood will flow through them so the blood stream would come in contact with the parenchyma of the gland (the working part or functional properties of any organ or gland) not only to nourish the gland itself, but also to receive in return the benefit of its function, which would be our objective. We may therefore end the controversy and stop here—until the ways and means are devised; first, to keep the tissues of any organ alive, after removing it, and second, again connect it up with the blood stream (when transplantating it in time of need) so it will remain alive and function—so far as any operation for "organ transplantation" is concerned.

"If I have sometimes disturbed the calm of our academies by somewhat violent discussions, it was because I was passionately defending the truth."
—*Louis Pasteur.*

OUR VITAL GLANDS:—

One of the most important and very frequent causes of disarrangement of (our vital glands) these ductless glands, thereby altering the amount of the internal secretions, is any great mental shock, for instance, the death of a beloved one, or, having been in a railroad wreck, also, a severe injury, as a blow or fall on the head. This shock from any of these causes has in many instances terminated in insanity. It is very evident in all cases, that both the ductless glands and the mentality suffered. This insanity in some cases has caused self-destruction, in others it was the cause of murder, sometimes the slaying of members of their own family. In many instances the individual became a temporary or permanent inmate of an insane asylum. Now the question is, did the shock affect the brain tissues primarily with a consequently secondary disarrangement of the ductless glands and their internal secretions, or did the shock affect the ductless glands at first, in some unknown manner, and the brain tissues in turn suffering from want of these internal secretions, cause the individual to become mentally deficient, or is it an unknown secondary complication of a special nervous system between this group of glands, due primarily to the shock, terminating in a mentally unbalanced condition. In reference to the above we have, to a marked degree many

living examples where practical demonstrations present themselves as follows: the individuals who have spasms of hysterical laughter, over which they have no control, even though they realize the situation, at times, is causing much embarrassment to their friends and they are making fools of themselves. Then we have the individual who harbors a grudge and in time, from constantly thinking and moodily brooding over the matter, this becomes a morbid hatred, in these cases unless there is a change of environment with extenuating circumstances, the final termination is the committing of a wilful act, perhaps premeditated murder.—Here may be mentioned the so-called "green-eyed-monster," jealousy; in this trait of humanity can be seen the connection involving first, ambition, and the fire of youth; second, love or individual affinity; third, hatred and desire of vengeance; all of which have to do (no doubt, more or less in every case) with the powers exerted on the individual by the action or function of the endocrine glands, especially so in cases where two individuals (man and wife who love each other) are intimately acquainted with each other, having enjoyed that one great happiness in life, the satisfying of the cravings of the "depths of the soul" and the acquisition of the knowledge which takes the individual soaring to the "heights of our only known earthly heaven."—The nervous breakdown is the most common, being caused by continued worry and mental strain over financial affairs, or as a result of grieving over the loss of a beloved one. Any of these types of cases may, and often do, end in self-destruction. When this

happens we call it, in some instances, disappointment in life, in others, disappointment in love; both are frequent in every-day life. Again we ask the question: is this spasmatic hysteria, moody brooding, continued worry, or mental strain, as we call them, brought about primarily by faulty function of the internal secretions, permitting these conditions to prevail upon the individual, at different instances in life, as a secondary complication and in time bringing about a third stage, the so-called derangement of the mind in its several types or forms, wherein are conceived (and later committed) these different acts?

There are times when one would think that this is truly a man's world and the woman has more than her share of the worldly burden. We will now mention another important point which has a great deal of bearing on the question and involving a phase of the evolution of the woman. There comes a time in every woman's life, providing she lives long enough, be that woman a mother, wife, sister, daughter or sweetheart, it matters not, none can escape, that time of life when—with more or less apprehension—neurasthenia and insanity are to be feared. It arrives at about the age of forty and affects all females, more or less, regardless of race, color, or creed. Herein lies our ground for extensive study and much food for thought. We do know the gonads of the female are intimately connected with the "Endocrine system," we also know the "mentality" of the female "suffers," more or less, in every woman, at the time of "menopause," or so-called "change of life," (this "change of life" may also occur to a marked

degree, in some instances, in the male sex; no one has proven as yet, that it does not) and this aspect of things will indeed need much investigation, from its many angles.

We find on record, especially of late years, many cases where organotherapy has been used to advantage and in some cases with what might be expressed as miraculous results. Cases of individuals that would have undoubtedly been in every instance, a wasted and empty life, a physical and mental defective, a deformed pigmy or hopeless idiot, perhaps both, and a permanent invalid at home, or a subject for the insane asylum; in any case a care and a burden to his or her family and to society. To watch the improvement under treatment, of this helpless and anticipated blotch on humanity, this misshapen misanthrope, or this monstrosity of nature, transformed into a comely woman or a robust man; the anticipated life of isolation and deprivation rightfully cheated, and see this individual enjoy the comradeship of its kind and kindred, this is indeed worthy of endless effort. The wonderful improvement in these cases is no longer a coincident, as it was one time called, but is now a fact, a sterling reality worthy of note, that in most cases of this type there is a vast improvement when once understood and properly treated. It has been accomplished many times in the past and will be again more frequently in the future as we grow to understand, more every day, the specific nature of these ductless glands and their internal secretions. It would be very wonderful, if in the near future we should be able to reduce to more than one-half, the number of inmates

at the present time in our insane asylums, by a treatment now in the beginning of its making and known as, Organotherapy.

INFERENTIAL JUDGMENT:—

So far as the interstitial gland transplantation operation is concerned, we may now draw our several conclusions. It being understood, of course, that no one should presume so far as to assume, that he were his brother's keeper, and if any individual will insist that he or she must have a gland transplantation operation, that is any one's own business and is strictly a personal affair, however, *it would seem that in such a case, there should be selected one or two, or more, of all the glands so closely related in this group, so as to be sure that the proper one is secured* and if any individual feel so disposed, to carry around (stowed away in different parts of the anatomy) a few pounds of excess baggage in the form of glands, with the hope that, "in some future day" his "youthful days" of vim and vigor will return, that is again his own business. In this case one may take his choice—there are monkeys, goats, dogs, cats, pigs and jackrabbits to choose from; (any of which will be just as effective as glands of the anthropoid ape or the human) all are easily obtained and according to the view of some operators the operation is quite harmless, provided, you are rich in cash and you are so disposed to spend plenty of it. On the other hand, this is, according to all evidence to date, positively a useless operation, which may prove very dangerous to health and may terminate fatally. These

are the two ultimate views, according to present knowledge at hand on the subject and it is truly impossible to advise, at the present time, any operation of this nature, because it has not been proven that the interstitial gland is the particular gland which is needed in the first place, and also, because it is the secretions from the gland which are needed, the gland itself being useless unless it can function after the operation.

Many eminent physicians and surgeons, recognized as up-to-date authorities on the subject, are now advocating that *"other glands than the gonads" in the endocrine group,* are apparently responsible or play an important part in the loss of youth or vim and vigor, in middle life and the aged.

It would be well for any individual who is anticipating a gland transportation operation, due to the fact that he or she has, seemingly, lost youth and ambition, to consult at once the family physician as there are a great many factors involved in such cases. It may be shown upon or after a good physical examination that this case is something entirely foreign to what the individual thinks it is and your physician can advise you. *Scientific investigation has shown, and some of our best authorities agree, that such disturbances as will affect the thyroid, pituitary and adrenal glands, separately or together, in many cases, will interfere with, or interrupt the function of the gonads, and in some cases entail a complete loss of sexual power, as surely as does the operation of castration.*—Incorporated within the terms "sexual power," in this instance, are meant the several

factors, such as, ambitious desire and physical ability on the part of the individual, as man or woman (as conscious thinking persons); normal control (mentally and physically), with tendencies to satisfy the inclinations in accordance with the natural or normal laws of human nature; the normal functioning of all the essential organs within the human (the unconscious and continual performing cycle of our inner-selves), involving, secretion, excretion, production and reproduction.— This knowledge we have today, tomorrow we may learn other important facts. It is essential that the public should have some knowledge of the facts on this subject, but to convey these facts to the laity is not a simple matter. At the present time this is not, altogether, a simple subject and not quite plain even to the medical profession in general, to the extent of explaining the complications of the subject matter to the average individual. In other words, the general practitioner knows there is much to learn and many points of obscurity upon which much light must be thrown; therefore he does not pretend to know very much about the details on the subject, because it is not within the jurisdiction of his knowledge at the present time.

It is admitted and advocated by many reliable investigators, that we may expect great things from this source of study, but up to date there is very little knowledge which may be called definite. Inasmuch, however, as this phase of our knowledge is still shrouded in considerable obscurity, the more salient conceptions and instances have been given and presented, in understandable terms, se-

lecting those which seemed most clear to explain the different phenomena as observed in each instance of a given case. Further comment is unnecessary. The facts speak for themselves, in the present day gland transplantation operation. As to the question of the hormones, there is no doubt of our attaining in the future, the knowledge of their consequential usefulness, in action and purpose, in health and disease, and their influence in life and death.

PERSONALITY:—

Finally, we may assume that "Life" is, on the part of all nature's work as well as on the part of every normal individual, an inherited "tendency" to reproduce its kind; this "tendency" being the result of a cycle of several developmental periods, which involve it is said, seven stages; beginning with (1) the innocence of infancy, followed by (2) the joys of childhood, (3) the spirit of youth, (4) the manhood or womanhood in which is manifested the hidden potentialities of an incomprehensible desire, leading to an act (participated in by male and female) governed by nature's laws and over which these individuals have no control, culminating, sooner or later, in "conception" on the part of the female: (the term "no control" in this instance is intended to convey the following meaning: all those instances where two mutual affinities meet, especially, legal wedlock.)

> When in the sanctum of the rose scented
> boudoir, two beings in each other's arms,
> (clasped so tight, and oh, so close) all
> the world is forgotten, while now is seen

a new light; kindled in these two souls
a new "innocence of affinity" is born,
(adorned only in nature's simple dress)
each adores the other, while revelations
come; to these lovers (man and wife)
there is no wrong, all is right, (children
once again, in a new world of light)
when in the stillness and the darkness
of the night the great round silvery moon
(oh, so bright) steals away that precious
darkness (of no intrinsic worth); but, to
these lovers there is no light (of nature)
to mar their nuptial bliss, she (to him)
appears as a Venus form, he is (to her)
the Apollo of her dreams (it is love); the
warmth of the blood, (it is life) at the
mutual touch, fans this spark of love into
passion's flame.

That secret inclination or compulsory
force of animation, demands we obey
the commands of nature's laws;

Love and affinity, with cheek to cheek,
heart to heart, desire for desire, the
ecstacies of love's climax come;

—this conception being the result of an amalgamation (of an incorporation within the individual male and female elements, the spermatozoa and ovum which necessarily contribute to this conception in every instance, more or less), of the several characteristics of each of the parents—therefore, conception may truly be termed the "first stage" (being the primary period in the first stage, the innocence of infancy) of a "new life" the moral,

mental and physical qualifications of both parents being actually involved therein and must also be considered as essential factors in this primary period before actual earthly existence begins its first stage in life. After manhood or womanhood come (5) the parenthood or middle age, and then (6) old age, followed by (7) senility.

When we use the terms "no control" it is understood that circumstances and conditions are the essential factors concerned here; we are taught to control, at all times, our emotions and passions, yet we may give vent to our sorrow and cry to our heart's content (some people do, for days, weeks, and months) when death deprives us of a loved one; we may laugh ourselves sick in a theatre, while viewing a comedy (most everybody does if it is a good show), and we may go on our honeymoon and forget all else in the world; in our "letting down the gates" of the "earthly cravings of the soul" or of the "passions of love," or to give vent to the "ardor of youth;" call it what you will, it has been expressed as, enjoying or seeing "a little bit of heaven,"—which (we sometimes think) terminates only too soon—whenever there are found two lovers of mutual affinity. All the above are permissible in society, under special circumstances and conditions. It has also been noticed that, in times of war (when the passions are permitted to go on a rampage), special privilege is granted to plunder and destroy; when one human being seems to clamor for another human's blood, and may kill his fellow-men with immunity.

While we traverse these seven ages or during these seven periods, "there is or there is not'" a

development of "character" or "personality"—or the "personal equation," is or is not, worked out, —in every individual's life. The term "equation" (to equalize), is considered as an expression or statement of the equality of two quantities, in other words, an equation states an equality existing between two classes of quantities, distinguished as known and unknown; these correspond to the data of a problem and the thing sought.—In this relation (to our present subject) we must seek the special laws of, first, law of "similars" (analogy and affinity); second, law of "contrasts;" third, law of "coadjacency" (cause and effect); fourth, law of "preference," under the laws of "possibility."—When we wish to apply the term, "personality," in its "positive" or "negative" phase to any individual,—thereby assuming the attitude that we have accomplished the solution of the "personal equation" in that individual, denoting in a sense his or her individual assets or proficiency, on the one hand and the liabilities or inefficiency on the other, to cope with our so-called "success in life," —it is indeed a greater task in truth, than the average individual can realize; yet we do make our deductions (it is a common everyday occurrence) of other people in a kind of haphazard manner, when in reality we should indeed be more reserved in this matter.

After considering all of the above, its important points and facts on the subject, before endeavoring to give a logical synopsis as to the "whys and wherefores," or before attempting an explanation by mental effort, the entire subject resolves itself into this question; what is the cause or reason of

this particular partiality of bestowing of favors (by nature) on one individual at one time and the apparent prejudice or unfairness, or seemingly, an act of gross negligence (on the part of nature) of another individual at another time? There must be a "reason for or why" nature chooses to change the matrix, in every instance making every individual just a little different from the other, no two individuals being exactly alike. Herein, no doubt, lies the sequel to the secret.

As a consequence of elimination, when all the wrong factors or bad features are taken away, there must remain only the wholesome, the true and the good, in every and all instances in life. If the so-called Millennium is to be attained, it would seem reasonably justifiable to encourage any effort whereby a system or method could be found or worked out which would eliminate the extreme types of this negative phase (of personality or individuality) in all humanity. This would also seem a magnanimous and charitable action towards humanity, especially those who have a leaning or tendency toward the indolent or inefficient, perversion or fetichism, and the many so-called moron types. *We could then give to every individual, to some extent or to a marked degree, a goodly share of the positive phase, thereby bestowing upon him or her "some personality" and therefore "some success" and incidentally "the enjoyment of some of the fruits of life" and at least a small share of some of the things which make "life" worth while.*

It has been written "Man know thyself," and "Go forth and multiply,"—these two messages to

man handed down to us by our comparatively recent ancestors—together with, "The sins of the father are visited unto his children, even unto the third and fourth generation" (regardless of any particular religious beliefs), are in stern reality the true fundamental and underlying priciples of all human existence. When we learn to interpret these three messages correctly, it will no doubt (as a whole or a trinity), express in understandable terms, "the personality" or "the personal equation;" in other words, when we have learned these three lessons thoroughly, from every angle, we will then have passed the first milestone on the road of life pointing in the direction of the "Millennium."

CHAPTER XVI

CONCLUSIONS TO PART THREE

> "(Sir,) I have found you an argument; but I am not obliged to find you an understanding," and "A man always makes himself greater as he increases his knowledge."
>
> —*Dr. Johnson.*

ENDOCRINOLOGY:—

WHEN we consider the historical facts relative to Endocrinology together with those endeavors of the ancient physicians to divorce both superstition and religion from the practice of medicine, it brings home today—to our imagination—a vivid picture of the many hundreds of years wherein were fought a constant battle for supremacy, tending to place the practice of medicine and treatments of disease on a logical foundation. Those few men of long ago who could look far into the future no doubt knew that there must come a day when Endocrinology would play its part in the science of medicine.

In the next few decades "Endocrinology" or "The Study of the Internal Secretions," bids fair to proclaim the dawn of a new era for man in history of medicine (thereby adding much to the general betterment of all mankind), in his constant fight with all disease, its cause, its course, its conditions and sequela, also its treatment.

It is not necessary to relate in detail the "posi-

tively every day evidence" as manifested in "the known cycle of the life" as found in every female, and her relative knowledge of the existing or so-called natural relation, which surely lies in the action or normal physiological symptoms at the different ages or stages of her life, between the gonads and the mammary glands. Two periods in any and almost every life of the female are striking pictures; first, when at the age of about fourteen the monthly periods begin and the mammary glands show an increase in size; second, the significant physiological change when conception takes place and pregnancy begins, and the continual subsequent changes which must necessarily occur as a new life grows into existence until this new being is born, and even thereafter. These two features of every day evidence can and do, prove the intimacy of the complex relation between these two sets of glands and their associates in a much more satisfactory manner than any words in writing could explain.

Only the test of time together with the test of man's intellect and his labors of ingenuity, can say just what incredulous things of today will be brought forth as actual facts of material worth on the tomorrow. This is true of almost any science, but the small possibilities of yesterday, in the study of the Endocrine glands, have become great probabilities of today and a relative assurance of our tomorrow, in its great benefits to humanity.

The physiology of nutrition involves the study of the way in which the tissues of the body, and more especially the great master tissues, muscles

and nerves, obtain the material for growth and repair and the energy for mechanical work and health production, and the mode in which they get rid of the waste products of their activity. The study is, therefore, very largely a study of the history of the food of the body, since it is in the food that the necessary matter and energy are supplied. The subject of dietetics bearing on the composition and special importance of various foods, and the laws which regulate the supply of food under different conditions of the body, cannot be taken up at this time. However, we must mention here that the mode of digestion, the utilization and the elimination of the end products of the three great constituents, proteins, carbohydrates and fats, should be considered as being essential to our subject and involve, first, the chemistry of digestion; second, the mode of formation of the digestive secretions; third, the mechanism by which the food is passed along the alimentary canal; fourth, the absorption of food; fifth, metabolism; sixth, excretion.

The essential step which prepares the ordinary food for utilization in the body, for the change into living matter, is digestion, a process which the food undergoes under the influence of the ferments or enzymes present in the gastro-intestinal tract. By this process it is broken down into simpler substances, which can be utilized by the body tissues for conversion into protoplasm and as the supply of energy. That part which is unsuited for use in the body is either passed as feces or absorbed and excreted in the urine.

The substances which bring about this change

are known as ferments, enzymes or zymins. Formerly it was believed that there were two distinct classes of enzymes, those which were living or associated with living cells, and those which were non-living. In 1897, however, E. Buchner and M. Hahn showed that from living cells (yeast) a ferment could be obtained which acted quite as well extracellularly as when it was bound up within the cell. Subsequent work has shown that other organisms act by the enzymes they contain, so that it is now recognized that there is no essential difference between the living or organized ferment and the non-living or unorganized ferment. All ferments probably act as catalysators or catalysts. Catalysis is the process by which reactions are either initiated or accelerated by the mere presence of certain substances which remain unchanged during the process; to these substances the name of catalysators has been given. As an example of such catalytic action the acceleration of the decomposition of hydrogen peroxide into water and oxygen by the action of a colloidal solution of platinum may be given. C. Oppenheimer defines an enzyme as a substance produced by living cells, which acts by catalysis. E. Fischer has shown that the action of ferments is specific, that is, the ferment only exerts its action on definite substances or substrates of definite structural arrangement. He has compared the relation of ferment to substrate to that of a key to its lock. Ferments which bring about the breakdown of proteins are without influence on fats and carbohydrates; those which decompose fats leave proteins and carbohydrates untouched, and so on.

The first of the digestive secretion which food comes into contact with is the saliva. This is the mixed secretion from the various glands, salivary and other, the ducts of which open in the mouth. The saliva, which is for the most part produced by the three large salivary glands, the parotid, the sub-maxillary and the sub-lingual, is a colorless or a slightly turbid viscous fluid with a faintly alkaline reaction and of low specific gravity. It contains a very small proportion of solids, which vary somewhat in amount and character in the secretions of the different glands. Mucin and traces of other proteins are present. Small amounts of potassium sulphocyanide may nearly always be detected. The functions of the saliva are twofold. First, it has a mechanical action moistening the mouth and the food and thus aiding mastication and swallowing by securing the formation of a proper bolus of food; it also assists by binding the particles together, an action of special importance when the food is dry. Second, in man and in some of the lower animals the enzyme ptyalin exerts an action in digestion on part of the carbohydrates of the diet. The starches or polysaccharids are broken down, first of all to the simple dextrins and then to the still more simple disaccharide, maltose, which is followed by the further breakdown of the maltose which does not exist at all or only in the merest traces in the buccal secretion. The action of ptyalin on starches is thus very similar to that of acids, except that it stops at the formation of maltose. Ptyalin acts best at a temperature of about 40°C. and in a neutral or faintly alkaline medium, its action

being inhibited by the presence of even very dilute solutions of the mineral acids. If the acid be in sufficient amount the enzyme is destroyed. For this reason the action ceases in the stomach whenever the bolus is completely permeated by the gastric juice. As it takes time for the gastric juice thoroughly to permeate the food mass, which remains for a considerable period in the fundus of the stomach unmixed with the secretion, salivary digestion goes on for about half an hour after food is taken.

There may be certain substances either present in the food or developed in the course of digestion, which directly stimulate the secretion originally started by a nervous reflex. E. Starling has drawn attention to this chemical mode of stimulating different organs. To the substances known and unknown which evoke the action, he gives the name of hormones, and such "hormone" action he does not limit merely to the secretory organs but extends to all cases where one organ is stimulated by chemical products formed in the same or another organ.

Most modern workers hold that the most effective stimulus to the pancreatic flow is the chemical one—a hormone discovered by W. Bayliss and E. Starling, who found that extracts of the duodenal mucous membrane made with dilute hydrochloric acid when injected into the blood caused a flow of pancreatic juice. The active substance present in this extract is known as "secretin," and is supposed to be formed under natural conditions by the action of the acid chyme on a prosecretin. This secretin is not of the ordinary zymin (en-

zyme) nature, as it is not destroyed by boiling and is soluble in alcohol. The secretin when formed must be absorbed into the blood and then carried round the circulation to the pancreas before it can act.

The mode of action of the stimuli which evoke this secretion has not yet been fully investigated. As has been stated, it is quite possible that very little ferment is secreted, and that ferment action mainly takes place within the cells after the various substances have been absorbed. How far the flow is controlled by nervous action, and how far by hormone action, is not known.

The apparent importance of the ductless glands and their secretions, seems to be primarily, to protect and preserve life. And secondarily, the creating and granting the powers to the average individual to resist or neutralize the many different kinds of toxins which enter the human system in many ways; the numerous chemical poisons in solids, liquids and gases, the several drugs to which many individuals are hypersensitive and cannot tolerate; the various incompatible substances found in fruits and other foods, causing an anaphylatic condition (a toxicemia which may be mild or severe) also the different forms of ptomain and leukomain poisoning; the bites and stings of insects, also those toxins of a parasitic or bacterial nature. The apparent declaration of non-tolerance (by the human body)—in accordance with all the laws of human nature—of the much advocated and so-called interstitial gland transplantation operation (as it is being done today in a positively promiscuous manner) with the

possibilities of its detrimental effects if continued as an every-day practice.

From a scientific standpoint of study including anatomy, histology, physiology, pathology and treatment all authorities on the above subjects admit and recognize the following facts. All these glands are intimately related to each other in many ways, especially by way of the blood stream. Microscopically it can be demonstrated that in many instances the cells and structure of these glands resemble each other. The function of all are necessary to the human economy and the product of each gland is essential to the other. That when any of these glands are affected by disease to any great extent, there are radical changes in the health of the individual thus afflicted, which usually terminates fatally. When one or more of these glands are affected the treatment in many cases is that of organotherapy, which means, that in most instances a mixture of two or more extracts (in the dry or solution form) of these glands is given the patient. In some instances the extract of only one gland is used.

The writer has endeavored to show, first, that it is an actual fact that the so-called Hormones, Enzymes, or Ferments, are contained in the internal secretions; second, that the internal secretions are the product of the endocrine glands; third, that each gland is essential to the other; fourth, that these Hormones, Enzymes, or Ferments, are live minute bodies and can only be produced by these glands when these glands are alive and in good health; fifth, that the extract of these glands, in a solution or dry form will act as a stimulation

to these glands, when properly administered under necessary conditions and circumstances; sixth, that when these glands are transplanted in accordance with surgical methods of today they produce no results because their blood supply is cut off when removed and therefore they die. The gland then acts, when transplanted, as a foreign body and is surrounded by a connective tissue process thereby becoming a walled off object, and nature innocently destroys our intention and unknowingly robs us of our purpose.

It is the contention of some, that any individual who will respond to a gland transplantation operation (in the event that such operation could be successfully performed) will also respond to other methods of organotherapy; the large percentage of results (in organotherapy) prove it. The failure in the gland transplantation operation is apparently partly due to the fact that only one type of gland is used, if two or more kinds of glands are used it may or may not produce better results; this is a question for future study.

HORMONES:—

Now we come to the question: what are these minute bodies, the so-called Hormones, Enzymes, Ferments or granules? It would not be fair to the reader to pass this important question, or entirely omit saying something about these "minute bodies." Also, it is necessary that we eliminate, as far as possible, all apparent "mystery and enigma" and give, in understandable terms, at least a substantial explanation which will be of some little material worth and much scientific im-

portance, as well as a goodly knowledge of benefit in general, to the average individual. As in all studies of any consequence it is impossible, at the present time,—in this instance because of our meager knowledge on the subject as a whole and because of the apparent corresponding nature and the complex approximate relations of each to the other—to draw a hard and fast line between the different names by which these "minute bodies" are now known or between the "minute bodies" themselves, or their individual actions in every instance. Also it should be remembered, as it is not an easy task to separate a cow from its calf, also a difficult matter to part a mother from her infant, so is it almost impossible, at times, to consider these "minute bodies" separately, and as a subject set apart from the endocrine glands; the "minute bodies" being either the direct descendants, in a way, or the actual product of the endocrines proper; or the resulting issue of an "amalgamation of function" of these glands, individually or collectively.

Let it be understood at the beginning, that there has been nothing of an absolutely definite nature determined up to date, which would warrant the application of any specific name to signify or designate these "minute bodies," singly or collectively. We can only draw conclusions and make deductions from the experiments and experience of those scientific men, who have thus far, worked out what little knowledge we now possess, by many years of study. It may be correctly stated that while no one is absolutely certain as to just what the specific functions (in some instances) of

these minute bodies are, we do know that they surely exist. Their individual origin and ultimate termination is as yet a matter of conjecture. As the many different investigators have found that the different internal secretions, containing these minute bodies, have different reactions when subjected to the different tests, under different conditions, it is quite natural that we should find many names, each investigator appropriating a name most desirable and suitable in each case to meet the requirements and answer his purpose. In the literature we find such names as hormones, enzymes, ferments, granules, gemmules, idiosomes, protomers and many more. It is of little consequence at present just what name we give these "minute bodies" and as all writers (apparently) have their own term for them, we will for a matter of convenience, also because it is the most popular name used today, call them hormones.

Hormone, is from the Greek and has been translated, by different authors, into the meaning, "I arouse;" or, "to set in motion;" or "I excite." The definition is given as: a chemic substance produced in an organ which, being carried to an associated organ by the blood stream, excites in the latter organ a functional activity.

As to the word itself and definition of the term "enzyme" (from the Greek, in, and leaven, meaning, leavened; or to cause to affect in character; or any influence that causes a general change); it no doubt was first suggested by Kuhne, being used to express an unorganized ferment, or a group of substances, found in the constitution of plants and animals, which decomposes or trans-

forms certain carbon or other compounds occurring in close approximation or in association with them.

In viewing the history of medicine we find scattered and commingled (in some instances in a more or less haphazard manner), the term "ferment." As an example: the "Zymotic" diseases (in this instance the term "zymotic" is from the Greek word, meaning, "ferment"), was a term used in medicine, being applied to the class of acute infectious maladies. As originally employed by Dr. W. Farr, of the British Registrar-General's department, the term included the diseases which were "epidemic, endemic and contagious," and were regarded as owing their origin to the presence of a morbific principle in the system, acting in a manner analogous to, although not identical with the process of fermentation. A large number of diseases were accordingly included under this designation. The term, however, came to be restricted in medical nomenclature to the chief fevers and contagious diseases such as, typhus and typhoid fevers, smallpox, scarlet fever, measles, erysipelas, cholera, whooping-cough, and diphtheria. In our modern literature the word "ferment" has given way to the more recently coined terms, "enzymes" and "hormones," in the study of the internal secretions. However, today the term "ferment" may be defined as, to agitate; to stir with passion; to produce fermentation. Fermentation (from the Latin, fevere, meaning, to boil) is considered generally as a chemical decomposition or reaction of an organic compound, induced by living organisms or by chemical agents.

The process of fermentation in the preparation of wine, vinegar, beer and bread was known and praticed in prehistoric times. The alchemists used the terms fermentation, digestion and putrefaction indiscriminately; any reaction in which chemical energy was displayed in some form or other—such, for instance, as the effervescence occasioned by the addition of an acid to an alkaline solution—was described as a fermentation and the idea of the "Philosopher's Stone" setting up a fermentation in the common metals and developing the essence or germ, which should transmute them into silver or gold, further complicated the conception of fermentation. As an outcome of this alchemical doctrine the process of fermentation was supposed to have a purifying and elevating effect on the bodies which had been submitted to its influence. Johann Becher, in 1669, first found that alcohol was formed during the fermentation of solutions of sugar; he distinguished also between fermentation and putrefaction. In 1697 George Stahl admitted that fermentation and putrefaction were analogous processes, but that the former was a particular case of the latter.

The beginning of definite knowledge on the phenomenon of fermentation may be dated from the time of Antony Leeuwenhoek, who in 1680 designed a microscope sufficiently powerful to render yeast cells and bacteria visible; and a description of these organisms, accompanied by diagrams, was sent to the Royal Society of London. This investigator just missed a great discovery, for he did not consider the spherical forms to be living organisms but compared them with starch granules. It

was not until 1803, that L. J. Thenard stated that yeast was the cause of fermentation, and held it to be of an animal nature, since it contained nitrogen and yielded ammonia on distillation, nor was it conclusively proved that the yeast cell was the originator of fermentation until the researches of C. Cagniard de la Tour, T. Schwann and F. Kutzing from 1836 to 1839 settled the point. These investigators regarded yeast as a plant, and Meyer gave to the germs the systematic name of "Saccharomyces" (sugar fungus). In 1839-1840 J. von Liebig attached the doctrine that fermentation was caused by microörganisms, and enunciated his theory of mechanical decomposition. He held that every fermentation consisted of molecular motion which is transmitted from a substance in state of chemical motion—this is, of decomposition—to other substances, the elements of which are loosely held together. It is clear from Liebig's publications that he first regarded yeast as a lifeless, albuminoid mass, but, although later he considered they were living cells, he would never admit that fermentation was a physiological process, the chemical aspect being paramount in the mind of this distinguished investigator.

In 1857 Pasteur decisively proved that fermentation was a physiological process, for he showed that the yeast which produced fermentation was no dead mass, as assumed by Liebig, but consisted of living organisms capable of growth and multiplication. His own words are: "The chemical action of fermentation is essentially a correlative phenomenon of a vital act, beginning and ending with it. I think that there is never an alcoholic

fermentation without there being at the same time organization, development and multiplication of globules, or the continued consecutive life of globules already formed." Fermentation, according to Pasteur, was caused by the growth and multiplication of unicellular organisms out of contact with free oxygen, under which circumstances they acquire the power of taking oxygen from chemical compounds in the medium in which they are growing. In other words "fermentation is life without air, or life without oxygen." This theory of fermentation was materially modified in 1892 and 1894 by A. J. Brown, who described experiments which were in disagreement with Pasteur's dictum. A. J. Brown writes: "If for the theory 'life without air' is substituted the consideration that yeast cells can use oxygen in the manner of ordinary ærobic fungi, and probably do require it for the full completion of their life-history, but that the exhibition of their fermentative functions is independent of their environment with regard to free oxygen, it will be found that there is nothing contradictory in Pasteur's experiments to such a hypothesis." Liebig and Pasteur were in agreement on the point that fermentation is intimately connected with the presence of yeast in the fermenting liquid, but their explanations concerning the mechanism of fermentation were quite opposed. According to M. Traube (1858), the active cause of fermentation is due to the action of different enzymes contained in yeast and not to the yeast cell itself.

Fermentation now includes all changes in organic compounds brought about by ferments

elaborated in the living animal or vegetable cell. There are two distinct types of fermentation; first, those brought about by living organisms (organized ferments), and second, those brought about by non-living or unorganized ferments (enzymes). The first class include such changes as the alcoholic fermentation of sugar solutions, the acetic acid fermentation of alcohol, the lactic acid fermentation of milk sugar, and the putrefaction of animal and vegetable nitrogenous matter. The second class includes all changes brought about by the agency of enzymes, such as the action of diastase on starch, invertase on cane sugar, glucase on maltose. The actions are essentially hydrolytic. The Saccharomycetes belong to that division of the Thallophyta called the Hyphomycetes or Fungi. With certain rare exceptions the Saccharomycetes have three methods of asexual reproduction; first, the most common form is the formation of "buds" which separate to form new cells. A portion of the nucleus of the parent cell makes it way through the extremely narrow neck into the daughter cell. This method obtains when yeast is vigorously fermenting a saccharine solution; second, a division by "fission" followed by Endogenous spore formation, characteristic of the Schizoasccharomycetes. Some species show fermentative power; third, the "endospore" formation, the conditions for which are suitable temperature, presence of air, presence of moisture, young and vigorous cells; a good food supply in the case of one species at least is necessary, and is in no case prejudicial. In some cases a sexual act would appear to precede spore formation. In

most cases four spores are formed within the cell by free formation. These may readily be seen after appropriate staining.

Different workers have endeavored to show the several angles and demonstrate the many-sided actions of ferments. Some view them from one angle only while others hold they must be considered from many view-points; as a consequence we find the "chemical" or inorganic view-point; the "physiological" or functional view; the "live" or organic version.

In regard to catalysis in heterogeneous systems, especially the hastening of gas-reactions by platinum, it is very probable that it is closely connected with the solution or absorption of the gases on the part of the metal. From the experiments of G. Bredig it seems that colloidal solutions of a metal act like the metal itself. The action of a colloidal-platinum solution on the decomposition of hydrogen peroxide is still sensible even at a dilution of 1/70,000,000 grm.-mol. per litre; indeed the activity of this colloidal-platinum solution calls to mind in many ways that of organic ferments, hence Bredig has called it an "inorganic ferment." This analogy is especially striking in the change of their activity with time and temperature, and in the possibility, by means of bodies like sulphuretted hydrogen, hydrocyanic acid, which act as strong poisons upon the latter, of "poisoning" the former also, that is, of rendering it inactive. In the case of the catalytic action of water-vapor upon many processes of combustion already mentioned, a part of the effect is probably due to the circumstance, disclosed by numerous experiments, that the union

of hydrogen and oxygen proceeds, between certain temperature limits at least, after the equation $H_2+O_2=H_2O_2$, that is with the preliminary formation of hydrogen peroxide, which then breaks down into water and oxygen, and further, above all, to the fact that this substance results from oxygen and water at high temperatures with great velocity, though indeed only in small quantities.

Circulating in the fluid of the arteries and veins of animals, in addition to the many substances found in the blood-stream, three ferments are also described as being present; first, the glycolytic ferments which exert an action on the sugars found in the vegetable kingdom and other foods; second, the lipase or fat-splitting ferments; third, the diastase or starch-splitting ferments which are capable of converting starches into sugar; all of which play their part in the metabolism of the human.

Versed Opinions:—

Pasteur's important researches mark an epoch in the technical aspect of fermentation. His investigation on vinegar-making revolutionized that industry, and he showed how, instead of waiting two or three months for the elaboration of the process, the vinegar could be made in eight or ten days by exposing the vats containing the mixture of wine and vinegar to a temperature of 20° to 25° C., and sowing with a small quantity of the acetic organism. To the study of the life-history of the butyric and acetic organisms we owe the terms "anaërobic" and "aerobic." His researches from 1860 and onwards on the then vexed question of spontaneous generation proved that, in all cases

where spontaneous generation appeared to have taken place, some defect or other was in the experiment. Although the direct object of Pasteur was to prove a negative, yet it was on these experiments that sterilization as known to us was developed. It is only necessary to bear in mind the great part played by sterilization in the laboratory, and pasteurization on the fermentation industries and in the preservation of food materials. Pasteur first formulated the idea that bacteria are responsible for the diseases of fermented liquids; the corollary of this was a demand for pure yeast. He recommended that yeast should be purified by cultivating it in a solution of sugar containing tartaric acid, or, in wort containing a small quantity of phenol. It was not recognized that many of the diseases of fermented liquids are occasioned by foreign yeasts; moreover, this process, as was shown later by Hansen, favors the development of foreign yeasts at the expense of the good yeast.

About this time Hansen, who had long been engaged in the researches of the biology of the fungi of fermentation, demonstrated that yeast free from bacteria could nevertheless occasion diseases in beer. This discovery was of great importance to the zymo-technical industries, for it showed that bacteria are not the only undesirable organisms which may occur in yeast. Hansen set himself the task of studying the properties of the varieties of yeast, and to do this he had to cultivate each variety in a pure state. Having found that some of the commonest diseases of beer, such as yeast turbidity and the objectionable changes in flavor, were caused not by bacteria but by certain

species of yeast, and, further, that different species of good brewery yeast would produce beers of different character, Hansen argued that the pitching yeast should consist only of a single species—namely, that best suited to the brewery in question. These views met with considerable opposition, but in 1890 Professor E. Duclaux stated that the yeast question as regards low fermentation has been solved by Hansen's investigations. He emphasized the opinion that yeast derived from one cell was of no use for top fermentation, and advocated Pasteur's method of purification. But in the course of time, notwithstanding many criticisms and objections, the reform spread from bottom fermentation to top fermentation breweries on the continent and in America. In the United Kingdom the employment of brewery yeasts selected from a single cell has not come into general use; it may probably be accounted for in a great measure by conservation and the wrong application of Hansen's theories.

In 1879 C. Nageli formulated his well-known molecular-physical theory, which supported Liebig's chemical theory on the one hand and Pasteur's physiological hypothesis on the other; "Fermentation is the transference of the condition of motion of the molecules, atomic groups and atoms of the various compounds constituting the living plasma, to the fermenting material, in consequence of which equilibrium in the molecules of the latter is destroyed, the result being their disintegration." He agreed with Pasteur that the presence of living cells is essential to the transformation of sugar into alcohol, but dissented

from the view that the process occurs within the cell. This investigator held that the decomposition of the sugar molecules takes place outside the cell wall.

In 1894 and 1895 Emil Fischer, a German chemist, in a remarkable series of papers on the influence of molecular structure upon the action of the enzyme, showed that various species of yeast behave very differently towards solutions of sugars. For example, some species hydrolyze cane sugar and maltose, and then carry on fermentation at the expense of the simple sugars so formed. Fischer next suggested that enzymes can only hydrolyze those sugars which possess a molecular structure in harmony with their own, or to use his ingenious analogy, "the one may be said to fit into the other as a key fits into a lock." The preference exhibited by yeast cells for sugar molecules is shared by mould fungi and soluble enzymes in their fermentative actions. Fischer devoted himself entirely to organic chemistry, and his investigations are characterized by an originality of idea and readiness of resource which make him the master of this branch of experimental chemistry. In his hands no substance seemed too complex to admit of analysis or of synthesis; and the more intricate and involved the subjects of his investigations the more strongly shown is the conspicuous skill in pulling, as it were, atom from atom, until the molecule stood revealed, and, this accomplished, the same skill combined atom with atom until the molecule was regenerated. His forte was to enter fields where others had done little except break the ground; and his researches in

many cases completely elucidated the problem in hand, and where the solution was not entire, his methods and results almost always contained the key to the situation.

Emil Fischer may be regarded as the prime investigator in the field of what is known as the sugar group. His researches may be taken as commencing in 1883; and the results are unparalleled in importance in the history of organic chemistry. The chemical complexity of these carbohydrates, and the difficulty with which they could be got into a manageable form—they generally appeared as syrups—occasioned much experimental difficulty; but these troubles were little in comparison with the complication due to stereochemical relations. However, Fischer synthesized fructose, glucose and a great number of other sugars, and having showed how to deduce, for instance, the formulæ of the 16 stereoisomeric glucoses, he prepared several stereoisomerides, thereby completing a most brilliant experimental research, and simultaneously confirming the Van't Hoff theory of the asymmetric carbon atom. The study of the sugars brought in its train the necessity for examining the nature, properties and reactions of substances which bring about the decomposition known as fermentation. Fischer attacked the problem presented by ferments and enzymes, and although we as yet know little of this complex subject, to Fischer is due at least one very important discovery, viz., that there exists some relation between the chemical constitution of a sugar and the ferment and enzymes which break it down.

FINAL DEDUCTIONS:—

Why is youth, boys and girls of today at the sweet and tender age of sixteen, if not younger, on a continual rampage of pleasure? At times there is apparently, no visible means, ethical or physical, to control them in some instances until it is too late. Youth must have its fling and if they are lucky they will escape the many pitfalls in life before they attain the age when old enough to have good sense. There are many reasons for this existent condition in society. Society is the great foster-mother of us all, she controls the customs and practices, the fads and fancies, the pleasures and punishments, rules, regulations and teachings of the community in which we live and with her far reaching influence is to a great extent responsible for what we are and what we will be in childhood, youth, manhood and womanhood.

Our fore-fathers participated in the molding and the making of the moral, social and economical regime which has been handed down to us. It served them well during their lives. This code of ethics comprising the customs, laws, rules and regulations which acted as a guide in their economic, moral, religious and social life we have accepted. However, there were many of our ancestors who never saw a towering sky-scraper, aëroplane, submarine, automobile, ocean greyhound, electric street car, electric light, the telephone, telegraph, phonograph, and many more modern inventions. These things were mere suppositions, if anything, in their days. Today we see and use these many conveniences in every day life, they are the practical stern realities of neces-

sary contention and convention especially in cities of three or four millions of people with its ceaseless, merciless and competitive rush of life.

For the man who is strong, unafraid, ambitious and daring all these things have a strange possession of fascination and are the essentials of the "composite success" in modern times. Should we add to the above, the event of the moving picture and radio, the modern restaurant, dance-hall, pool-room and department store, and last but not least, the modern drug store where can be obtained any and all kinds of divers articles, including the much advertised remedies and cure-alls, the sole merit of which, in most instances, lies chiefly in the cleverly written and law-evading properties of a gaudy and alluring display of "inducements to buy" these products; and if we again add the events of "Dowie of Zion City" in the state of Illinois, the "House of David" in the state of Michigan, Christian Science Healing and the many other institutions and individuals of like cults, in its effect upon society, it is not a difficult matter to understand why, youth of today is ungracious and seemingly uncontrollable. All of this perplexing conglomeration of confusion, lends a complexion of a dubious nature to the mental and physical powers of youth today, terminating in the indiscretion of thought and the indefinite mode of action. On every side of life there are held out to youth inducements and indorsements pertaining to the mental and physical pleasures which constitute the joys and happiness of life, while youth is left to its fate, in this mental jungle of bewilderment as to what is righteous and good, and as to just what is

immoral and bad from a physical point of view, while floundering about in the sea of society.

In the years that have gone before there were two important factors responsible for the general good conduct, morally and physically, of the individual and society in general, especially youth. First, the practise of chastisement of the child at home and at the schoolroom. In its day this method did bring results, as in the training of dumb animals, but this method has seen its day. We now realize its significance of inconsistency, it is the method of the animal-trainer who by brute punishment would subdue the dumb beast. Man is only the higher animal it is true, but he has audible and understandable speech and proposes to have an intellect, wherefore he should not be introduced at an early age in childhood to cruelty or any other barbarian method as a means of inculcation of good breeding and civilization. Therefore, this old-fashioned method together with the old saying "Spare the rod and spoil the child" has been cast out of our regime as unfit, but what has taken its place as a persuading measure to teach the child and make it see and feel the difference between those things which are right and proper physically, and that which is good or bad morally; also the training of the understanding relative to the "essential need" of this instruction as being beneficial in life? It is safe to say that nothing up to date has taken the place of the rod of persuasion, unless it be, education.

The other important factor in the schooling of the child of yesterday which commanded obedience and good deportment in general was the in-

fluence of the church and the instruction of the Sunday-school. The days of our grand-parents and great-grand-parents brought to them much consolation because they were taught that system of religion which said, "Be thou a God fearing man and a law-abiding citizen of the community and thy days shall be long and fruitful; honor and obey thy father and thy mother and teach thy children to do likewise," or words to that effect. This system did they believe in and did they follow at any cost, even to the extent of brutal punishment. This system in conjunction with its methods will no longer maintain its influence nor substantiate its claims in the face of the advancement of the present system of education.

In the short time of a few decades, this system of "brutal punishment" and "strict religious" issues, has undergone alteration to a marked degree. The progressive changes in the several branches of our social system have played their part in the bringing about of this departure from the old system. We find it a rather difficult matter today when attempting to explain to youth, even to a slight degree of satisfaction, the customary story of the coming of the new baby and its source of relation to the ever present and kindly stork. This is all very well in the nursery and the kindergarten, where the rhymes and fables of "Mother Goose" play their part, but when youth of today has arrived at the age of puberty an explanation with a basis more substantial is necessary. Again we have the Biblical legends of tradition to contend with; the war in heaven, how Satan was dispossessed, the inconceivable and inconsistent

mythical story of how for nine days he and his cast out brood fell continually, headlong through space, eventually landing in his supposedly present place of abode, Hades. It is also beyond the conception of youth of today to even partially understand, in its broadest sense, just how, when Adam was asleep in the garden of Eden, Eve was created from a rib, removed from Adam. The utility of the legendary issues of yesterday, used as utensils of knowledge, will by no means hold water in our world of knowledge of today; the bottom has fallen out of them, so to speak. They have lost all the force of conviction when brought in contrast with our current literature and the present day schools of education. Today we must to a great extent confine ourselves to facts and get down to the stern realities of life in its making and living. The Mythology of Greece and Rome, and Biblical legends should be considered in a class by themselves as such. The inconsistency of these riddles (and many more) are the things which make youth of today doubt their authenticity. The old time system of introducing into society a standard of morality based upon a threat of eternal fire and brimstone in the hereafter and the holding over the head of every individual the religious club of everlasting condemnation to Sheol, is surely a failure. It has had its day and has been gradually failing for years. The most unfortunate and lamentable part of the whole matter is this: while this sorry state of affairs has been going on for years, no code of moral ethics of any consequence has been brought to the fore to take the place of our once revered good old fashioned religion.

It may be stated in all sincerity that our Theologians should be highly commended for their brave efforts and good work in holding together these many years their ship of state, which is fast going to pieces on the cruel and penetrating rocks of science. The seeker of truth in the different studies of scientific interest with the many modern inventions, and numerous discoveries as a result of research, has done much to bring about the astonishing revelations of recent years. Youth of today at the age of sixteen sees and learns all of these things; as a result of this up to date experience and information all restraint, from a moral and physical view, is apparently lost.

The sum and substance of our present regime is this. Youth of today is thrown into a maelstrom of conflicting and confusing ideas, consisting of many religions, many cults, many schools of medicine, many laws, political machinations beyond numbers, and graft running riot in every walk of life, the greed for gold ever prevalent, worship of the almighty dollar practically unanimous. Add to the above our new inventions and customs, leaving in its wake new inducements and temptations playing their overtures in many tunes of solicitation, preying upon the susceptibilities of human nature. When we consider all these vital angles pertaining to life, it can readily be seen that youth is in a quandary of indecision, and a maze of uncertainty, not knowing which road to choose. Is it any wonder that life, in many instances, ends in a tragedy?

It is quite evident there will come a time when the ways and means will be found to incorporate

in our system of education the studies of biology, physiology, anatomy, microscopy, bacteriology, pathology and hygiene. Only the fundamentals of these subjects will be necessary. The important subject of hygiene should be given consideration from a mental, physical, and to a degree sexual standpoint. Youth will then comprehend and will see the folly of "that which is wrong" and choose "that which is right." Let it be demonstrated to the student, by the proper methods, the cause and effect and the dire consequences of disease. Teach youth something about themselves and their future functions in life, relative to whence they came and why, how they should live, and how they should die. False pride and ignorant modesty beget, in every sense of the word, degradation; this is the lesson being apparently taught society by our present adherence to the old standards of morality. The advancement of learning and late changes in our social system have caused to change and make incompatible, for the large majority of humanity, our old moral standards, in the face of progressive civilization.

By educational means and in a logical manner we can bring forth the strongest kind of argument as to the whys and wherefores of guarding our health and living a clean, honorable and righteous life, from a moral, physical and social point of view. Remove the obsolete shade of obscurity where we find much of the needless so-called chastity, wrapped about in concealment with its cloak of ignorance. Exposure to the rays of enlightenment is the primary and essential factor. It is of course beneficial to the health, also well and

good for conventional reasons that we clothe our nudity of body and purity of soul with modesty, but why not inaugurate the magnanimous and magnificent mantle, "knowledge," of proper proportions and necessary fundamentals, in place of the remnants of rags and tags of the cloak of yesterday, which was once upon a time, well fitted and quite comfortable, but has served its day of usefulness. The crazy-quilt patch-work which has been done to save its reputation, now identify it as a fabric of shoddy, having deteriorated into gaudy pretentions, slovenly habits, elusive acts, equivocation, imitation, substitution, lewdness and vice in its many forms. A strong remonstrance with youth relative to the ravages of disease will surely carry forceful convictions, if we would cope with the extravagant drama of grotesqueness, portraying as it does in the every day walk of life of the present era, the capability of human extremes and exorbitance now rampant in society, claiming its victims of sacrifice one by one on its altars of repentance, day after day. No doubt these circumstances endure as a result of the signs of the times or perhaps, the irony of fate, which may be termed as, "a series of reactions," necessary in the cycle of life; ultimately terminating in the long sought Millennium.

> Neither, the incessant wail, of the low bleak winds, from the great waste, and desolate regions, in the frozen North.
>
> Nor the stolid stillness, of the coldness, and chill, from the vast fields of ice and snow in the frigid Antarctic.

Nor the parch drought, of the sandy
desert lands, wrought by the yearly
constant scorching, of the Sun's rays.

Nor the earth's quaking, with its great
temblors and terremotos, causing chaos,
havoc and destruction in its wake.

Nor the wroth and fury, of typhoons and
hurricanes, with their raging torrents
of water and threatening heavy gale.

Nor stalking death, from a dreadful
famine and the coming of pestilence,
in times of want and dire distress.

Nor the mired swale of ignorance and
ignominy, in its low state, with its
loud railing, for undue recognition.

Nor claptrap quackery, of charlatanism,
in its several forms of deception and
veneer pretensions of artificial work.

None Can nor Will, destroy the
outgrowth of Truth and Fact, in any
field of scientific research Work.

Which will Endure, for all time,
during the life of man, an essential
Need and Aid to All Humanity.

ADDENDUM

THE BEGINNING AND ENDING OF LIFE

The Author's Theory

CHAPTER XVII

PRELUDE TO THEORY

"E pluribus unnum; conjunctis viribus."
(Out of many one; with united powers.)

PHILOSOPHY, from the Greek, "fond of" and "wisdom," is a general term, whose meaning and scope have varied very considerably according to the usage of different authors and different ages. The earliest "philosophers" or "physiologers," had occupied themselves chiefly with what we may call cosmology; the one question which covers everything for them is that of the underlying substance of the world around them, and they essay to answer this question, so to speak, by simple inspection. Plato, in a happy moment, styled the philosopher as, the man who takes a "synoptic" or comprehensive view of the universe as a whole. The aim of philosophy (whether fully attainable or not) is to exhibit the universe as a rational system in the harmony of all its parts; and accordingly the philosopher refuses to consider the parts out of their relation to the whole whose parts they are.

It has been said, the world is not a collection of individual facts existing side by side and capable of being known separately. A fact is nothing except in relation to other facts; and as these relations are multiplied in the progress of knowledge the nature of the so-called fact is indefinitely modified. Moreover, every statement of fact involves certain general notions and theories, so that

the "facts" of the separate science cannot be stated except in terms of the conceptions or hypotheses which are assumed by the particular science. Thus mathematics assumes space as an existent infinite, without investigating in what sense the existence or the infinity of this "Unding," as Kant called it, can be asserted. In the same way physics may be said to assume the notion of material atoms and forces. These and similar assumptions are ultimate presuppositions or working hypotheses for the sciences themselves. But it is the office of philosophy, as a theory of knowledge, to submit such conceptions to a critical analysis, with a view to discover how far they can be "thought out," or how far, when this is done, they refute themselves, and call for a different form of statement, if they are to be taken as a statement of the ultimate nature of the real.

The sciences, one and all, deal with a world of objects, but the ultimate fact, as we know it, is the existence of an object for a subject. Subject-object, knowledge, or, more widely, self-consciousness with its implicates; this unity in duality is the ultimate aspect which reality presents. It has generally been considered, therefore, as constituting in a special sense the problem of philosophy. Philosophy may be said to be the explication of what is involved in this relation, or, in Kantian phraseology, a theory of its possibility. We may view knowledge as mere subjective function, but it has its full meaning only as it is taken to represent what we may call objective fact, or is such as is named (in different circumstances) real, valid, true.

It has been written, "Woman shall bear her child into the world in pain and sorrow," and so it was in the beginning, and so it has been, to the present day; as we understand it, this offspring thus begotten, is "the beginning of life." Also, we find written, "Remember, man, thou art but dust and into dust thou shalt return," and so it was in the beginning, and so it has been, from time unknown to the present day; this has been accepted as the end of man, and as we understand it, is the "ending of life." No one has ever come forward to prove that "the beginning" or "the ending" of life is otherwise; that it is true or that it is untrue; we therefore accept that which has been written, as the truth, so far as our present day knowledge is concerned.

Of late years we have learned many things about our material world and its environment. In recent years the following question has been asked many times. "Are we, or, are we not, in a better position in life, mentally, physically, morally and socially, than were our ancestors of the stone age period?" This question has caused much confusion and controversy, and so far as we know, is still a bone of contention.

In the stone age, men did live and die, and the worms did eat them while they rotted in their graves;—in some instances the insects, birds, or lower animals did consume the flesh of the dead body—so it was from the beginning and so it has been to the present day; provided, however, that our men of today be not rotten—primarily, rotten morally and socially and secondarily, as a consequence of an egregious nature, mentally and

physically—before they die, and just half live or exist, crawling about, in a body which is in reality only a shell, until the end comes.

While it is necessary—even with our vast amount of present day knowledge—to set aside as unknowable any true or accurate definition of "life" or, "death" or, in other words, to come out in the open and admit the truth of man's ignorance, relative to the questions, what is "life" and what is "death" or what is "the beginning and ending of life," and, whence came this combined power to man while he lives;—to hear, to see, to smell, to taste, to feel, to reason, to love, to live, and to die;—he has (at birth) invested himself (presumably by a process of evolution) with a mighty ægis, that with which, no other thing on earth can compare, and, whence goes, this combination of powers, when he dies? (It being taken for granted that to die is indeed a power; if we did not die but continued to grow old, what horrible things, misshapen and decrepit, might we ultimately become!)

It is within the realm of reason to assume that man upon earth will, some day in the near or far future, discover this fundamental principle, in "its beginning" and "its ending," at least, to the extent of learning those things relative to the "methods and means" of the underlying principles, sufficiently well enough to teach the generations of the future how to "begin" a life, how to "live" a life, and how "not" to "end" a life; all of which should be intelligent and righteous in all its requirements of original conception; healthy and beautiful in its beginning upon earth; good, true

and happy during its existence; contented at its coming end, eagerly looking forward with a general satisfaction to go.

"O, may I join the choir invisible
Of those immortal dead who live again
In minds made better by their presence; live
In pulses stirred to generosity,
In deeds of daring rectitude, in scorn
For miserable aims that end with self,
In thoughts sublime that pierce the night
like stars,
And with their mild persistence urge
man's search
To vaster issues."

—*George Eliot.*

Having come our earthly way, performed the duties and fulfilled the missions pertaining to the several mandatory functions, the future generations will pass on (as we will do and as did our ancestors); but their lives shall surely be more wholesome.

This strictly theoretical version, of that subject matter which is termed unknowable in the language of today, may prove to be a recognized study in the world of science of the tomorrow. For those who are interested and now groping in the dark, seeking some light in this direction, this theory will indeed be some food for thought. There are several points worthy of consideration, because it is always from one of these purely visionary sayings or writings that the truly original conception of any knowledge or science is born; call it initiative conception, inventive genius, creative mental capacity or call it what you will.

Whenever there is advanced any new theory, it is received, as a rule, by the people in general, as a launched avalanche of hocus-pocus and hoity-toity; there is little surprise but much public gossip and apparently it is the signal for all manner of timely jest. In this respect we of today have not changed much from the days of long ago; but it is easy to ridicule any apparently quixotic theory. After much bantering and battering, during the game of battledore and shuttlecock, which is sure to follow, there usually is left but very little of the original theory and the remaining shreds, which may justly be called "the remains," are buried deep by the group of opposition. The dogmatism of the old schools, on any subject—wherever this power is still in control—are ready and willing at all times, to persecute and prosecute any and all originators, as well as their ideas; this happens in the every day walk of life, even in our own modern industries and commercial world.

In the practice of medicine, every now and then, some new theory of apparent worth and import is advocated; the vast majority of people in these instances seem to overlook two essential factors. First, has the theory been advanced by a recognized authority on the subject and do other learned men, on the same subject, share these views? Second, what is the nature and ultimate object of the new theory? When the first factor is gone over and proven to be in the affirmative, those who are arrogant in purpose or ignorant as to the subject matter, would do well to hold their peace. When the second factor is looked into and

found to contain points which are for the good and betterment of the human family then, why in the name of common sense, hamper and hinder its progress? It is of course understood, that in many instances, the first factor in question is a self-appointed prognosticator who is in reality nothing more or less than a quack or nature faker and the second factor in these types of cases is plainly evident as being, purely of mercenary purpose. These cases should be investigated and if physically possible, they should be exposed in their true light.

The author of this work first met Dr. Maximilian J. Herzog in the year of 1913. A short time thereafter the writer was appointed as one of the many assistants to Dr. Herzog, beginning at the bottom of the ladder in the laboratory; washing test-tubes, making culture media and doing the many chores such as are necessary in and about every laboratory where practical and scientific work is carried on pertaining to the study of Bacteriology and Pathology, in all its branches. By degrees the writer was promoted until the year 1917 when he became the personal assistant to Dr. Herzog, who at the time of his death, on August 9, 1918, was working on the so-called Enzymes, the writer being close by him until the last hour.

The initial notes were made, or the preliminary foundation of this work was begun about the beginning of the year 1918 when the writer had learned enough about the study of medicine and surgery, also research work, to notice the lack of knowledge or the want of knowledge in the field of "transplantation of organs." About the same

time, or soon thereafter, the writer became interested in the study of the "internal secretions," or the products of the "Endocrine" glands. These thoughts were the starting points, leading to clinical and research work in these fields of endeavor, including reading, writing, observation, experiments and experience of earnest exertion and extensive study. It may therefore be seen that the time consumed in preparation of this book has covered a period of about five years.

This association and study is largely responsible for the advancing of this theory. In so doing, however, it should be understood, that this theory is only intended as an idea of speculative value for the future, or an assumed hypothesis for future investigation, it being only partially based upon modern discovery, practical demonstration, conclusive evidence and late proven facts, in the field of clinical medicine with its allied subjects, including laboratory and scientific research work.

The theory involves many subjects and includes the many angles to these subjects. First, the life of vegetation, its apparent origin, vital constitution and general make-up; its function, reproduction and use, relative to the life of the human. Second, the chemical elements and its many combinations of composition; their essential need in the sustaining of the life of all humanity. Third, cell life, in the human being and in other forms or manifestations of life; cell production or proliferation and the cell function in different organs in the human body; the need of cell life in the human being and its necessity to the reproduction and development in the life of the human.

Fourth, the many forms of bacterial life (their apparent origin and the important factors involved in their reproduction), their useful and practical value in some instances and their detrimental effects,—in other instances,—to the human family. Fifth, the apparent essential primary factors or the elementary substance (the so-called "granules" or "minute bodies" involved) in the reproduction or propagation of the human race. The origin of these factors and their apparent intrinsic value of their seeming importance are an absolute requisite in the primary contribution towards the promotion and developing of the origin or the "beginning of the human life," with its apparently prearranged affiliations of a clandestine nature; when viewed from another angle, this apparently deep laid plot of intrigue, with its defiance of detection (by the human intelligence), is without doubt, really and truly, the simple law of all nature, to-wit: the natural inclination of the positive for the negative; or the powerful force of affinity, or that known and admitted attraction which draws all positives and negatives together. Many times this occurs against the will of the positive or the negative or both, and in the nature of the human it often occurs; when they sometimes commit an act, knowing full well it is contrary to their better judgment and one or both of the participants would gladly fore-go this common act—an act which may prove to be an ordeal of serious consequences, socially or physically or both—and they will therefore attempt to fight off the act itself, but there are times when efforts to do so are of no avail. This is the call of attraction, or

the hidden force of affinity, or the natural inclination of "Absolute" or "Infinite" or "Ever Existing" law, namely, the force of attraction which draws the "positive and negative" together. The human mind, or will, or body has no power to control, or means to combat, or knowledge to defeat this law; it could not be otherwise; if it were, the world would have been depopulated long ago.

The term "Empire" is defined, as a state or union of states, governed by an emperor; or it may be designated as any wide and supreme dominion. It is from the Latin "Imperium" or "dominion," meaning rule or power. In the Latin we find written "imperium in imperis" and when we translate it, it reads, "empire within empire." Could there be a more concise definition,—pronounced by the word of mouth or written by human hand—to express those apparent constituents and conditions consisting of the thousand-fold cell-life, in its numerous variety of forms and activity, now existing within the different organs, contained within the human body, of every individual.

There must, indeed, be a strange clandestine dominion,—being continually carried on, among these wonderful "minute bodies," in the bio-physio-chemo-metabolic process and its endless chain of domination by intimate intercourse, by the way of the blood stream—amounting to a marvelous method of construction and a far-reaching ruling power, contained within the empire of this group of ductless or so-called endocrine glands (within the human) and again contained within this physical endocrine empire of these glands, an

empire of these "minute bodies" (factors) or so-called hormones.

The apparent function of these "minute bodies" (factors in the cycle of human life) are first, to procreate themselves; second, to generate cell life; and third, to bring into existence a human "being;" this may justly be termed "the beginning of human life;" then to protect and preserve the life of the "being" and at the same time to give (by a secret system of previous preparation of the "being," which is known only to these factors) to the "being" at the proper time (at the age of puberty) the powers of reproduction. In many instances when these factors disappear in large numbers, from any organ, or from the human body as a whole,—the reasons or causes being many—it apparently spells the doom of the organ, also perhaps, the doom of the individual possessing such organs, and may be justly termed, "the ending of the human life." For the present and for the want of a more appropriate name, we may term these ideas "The Gengemmule Theory."

CHAPTER XVIII

BASIS FOR THEORY

"Ex nihilo nihil fit"
(Out of nothing nothing is made)

IN the advancing or advocation of any theory, it is necessary that there be, at the very beginning, a resonable foundation to support its arguments and claims, or, at least a basis of contention wherein there is contained an ingredient of tangibility, perceptible (to the average individual) by touch or by the senses. The writer will therefore attempt to launch his theory, resting upon known facts of an indisputable character and of an apparently true nature; embodying these fundamental principles and underlying facts (principles and facts as recognized by the leading institutions, the world over, in the legitimate practice known as, the "science of medicine"), there will be found as a basis, what proposes to be in the near future, a new science "Endocrinology." At the present time this study or new science is finding much favor and deserving promotion in the medical world, because of recent discoveries and revelations as a result of much study and investigation in the field of scientific research.

The "science of medicine," as we understand it, has for its province the treatment of disease. The term "medicine" (from the Latin, *medicina;* the art of healing, from *mederi,* to heal), may be used very widely,—especially so when we include "pathology" (the science of the cause and effect

of disease, especially in the human) with its many allied and far reaching subjects essentially involved therein—or very narrowly, to mean only the drug or form of remedy prescribed by the physician (this being, properly speaking, a lone subject, therapeutics or pharmacology and is considered the important thing by most one-sided systems of treatment), but it is very necessary that we keep the wider and more comprehensive meaning in view.

Disease (pathology) is the correlative of health, and the word is not capable of a more penetrating definition. From the time of Galen, however, it has been usual to speak of the life of the body either as proceeding in accordance with nature or as overstepping the bounds of nature. Taking disease to be a deflexion from the line of health, the first requisite of medicine is an extensive and intimate acquaintance with the norm of the body. The structure and functions of the body form the subject of Anatomy and Physiology.

The medical art divides itself into departments and sub-departments. The most fundamental division is into internal and external medicine, or into medicine proper and surgery. The treatment of wounds, injuries and deformities, with operative interference in general, is the special department of surgical practice (the corresponding parts of pathology, including inflammation, repair, and removable tumors, are sometimes grouped together as surgical pathology); and where the work of the profession is highly subdivided, surgery becomes the exclusive province of the surgeon, while internal medicine remains to the physician.

In the state of society pictured by Homer it is clear that medicine has already had a history. We find a distinct and organized profession; we find a system of treatment, especially in regard to injuries, which it must have been the work of long experience to frame; we meet with a nomenclature of parts of the body substantially the same (according to Daremberg) as that employed long afterwards in the writings of Hippocrates; in short, we find a science and an organization which, however imperfect as compared with those of later times, are yet very far from being in their beginning.

It is only from non-medical writers that anything is known of the development of medicine in Greece before the age of Hippocrates. The elaborate collections made by Daremberg of medical notices in the poets and historians illustrate the relations of the professions to society, but do little to prepare for the Hippocratic period. Nor is much importance to be attached to the influence of the philosophical sects on medicine except as regards the school of Pythagoras. That philosopher and several of his successors were physicians, but we do not know in what relation they stood to later medical schools. We must therefore hasten onward to the age of Pericles, in which Hippocrates, already called "the Great," was in medicine as complete a representative of the highest efforts of the Greek intellect as were his contemporaries the great philosophers, orators, and tragedians. The medical art as we now practice it, the character of the physician as we now understand it, both date for us from Hippocrates.

The justification of this statement is found in the literary collection of writings known by his name.

The first grand characteristic of Hippocratic medicine is the high conception of the duties and status of the physician, shown in the celebrated "Oath of Hippocrates" and elsewhere—equally free from the mysticism of a priesthood and the vulgar pretensions of mercenary craft. So matured a professional sentiment may perhaps have been more the growth of time and organization than the work of an individual genius, but certainly corresponds with the character universally attributed to Hippocrates himself. The second great quality is singular artistic skill and balance with which the Hippocratic physician used such materials and tools as he possessed. The actual science of the Hippocratic school was of course very limited. In anatomy and physiology little advance had been made, and so of pathology in the sense of an explanation of morbid processes or knowledge of diseased structures there could be very little. The most valuable intellectual possession was a large mass of recorded observations in individual cases and epidemics of disease. Whether these observations were systematic or individual, and how they were recorded, are points of which we are quite ignorant, as the theory that the votive tablets in the temples supplied such materials must be abandoned.

After Hippocrates the progress of medicine in Greece does not call for any special remark at this time, but mention must be made of one great name. Though none of Aristotle's writings are strictly medical, he has by his researches in

anatomy and physiology contributed greatly to the progress of medicine. The century after the death of Hippocrates is a time almost blank in medical annals. It is probable that the science, like others, shared in the general intellectual decline of Greece after the Macedonian supremacy; but the works of physicians of the period are almost entirely lost, and were so, even in the time of Galen. Galen classes them all as the dogmatic school; but, whatever may have been their characteristics, they are of no importance in the history of the science.

The dispersion of the Greek science and intellectual activity through the world by the conquests of Alexander and his successors led to the formation of more than one learned center, in which medicine among other sciences was represented. Pergamum was early distinguished for its medical school; but in this as in other respects its reputation was ultimately effaced by the more brilliant fame of Alexandria. It is here that the real continuation and development of Hippocratic medicine can be traced. In one department the Alexandrian school rapidly surpassed its Greek original —namely, in the study of anatomy. The dissection of the human body, of which some doubtful traces of hints only are found in Greek times, was assiduously carried out, being favored or even suggested perhaps by the Egyptian custom of disemboweling and embalming the bodies of the dead. There is no doubt that the organs were also examined by opening the bodies of living persons—criminals condemned to death being given over to the anatomists for this purpose.

If we look at the work of the Alexandrian

schools in medicine as a whole, we must admit that the progress made was great and permanent. The greatest service rendered to medicine was undoubtedly the systematic study of anatomy. It is clear that the knowledge of function (physiology) did not by any means keep pace with the knowledge of structure, and this was probably the reason why the important sect of the empirics were able entirely to dispense with anatomical knowledge. The doctrines of Hippocrates, though lightly thought of by the Erasistrateans, still were no doubt very widely accepted, but the practice of the Hippocratic school had been greatly improved in almost every department—surgery and obstetrics being probably those in which the Alexandrian practitioners could compare most favorably with those of modern times. We have now to trace the fortunes of this body of medical doctrine and practice when transplanted to Rome, and ultimately to the whole Roman world. The Romans cannot be said to have at any time originated or possessed an independent school of medicine. They had from early times a very complicated system of superstitious medicine, or religion, related to disease and the cure of disease, borrowed, as in thought, from the Etruscans; and, though the saying of Pliny that the Roman people got on for six hundred years without doctors was doubtless an exaggeration, and not, literally speaking, exact, it must be accepted for the broad truth which it contains. When a medical profession appears, it is, so far as we are able to trace it, as an importation from Greece.

We now come to the writer who, above all

others, gathered up into himself the divergent and scattered threads of ancient medicine, and out of whom again the greater part of modern European medicine has flowed. Galen was a man furnished with all the anatomical, medical and philosophical knowledge of his time; he had studied all kinds of natural curiosities, and had stood in near relation to important political events; he possessed enormous industry, great practical sagacity and unbounded literary fluency. He had, in fact, every quality necessary for an encyclopedic writer or even for a literary and professional autocrat. He found the medical profession of his time split up into a number of sects, medical science confounded under a multitude of dogmatic systems, the social status and normal integrity of physicians degraded. He appears to have made it his object to reform these evils, to reconcile scientific acquirements and practical skill, to bring back the unity of medicine as it had been understood by Hippocrates, at the same time to raise the dignity of medical practitioners.

The rise of the Mahommedan Empire which influenced Europe so deeply both politically and intellectually, made its mark also in the history of medicine. In medical as in civil history there is no real break. A continuous thread of learning and practice must have connected the last period of Roman medicine already mentioned with the dawn of science in the middle ages. But the intellectual thread is naturally traced with greater difficulty than that which is the theme of civil history; and in periods such as that from the 5th to the 10th century in Europe it is almost lost.

About the middle of the 11th century the Arabian medical writers began to be known by Latin translations in the Western world. The impulse which all departments of intellectual activity received from the revival of Greek literature in Europe was felt by medicine among the rest. Not that the spirit of the science, or of its corresponding practice, was at once changed. The basis of medicine through the middle ages had been literary and dogmatic, and it was literary and dogmatic still; but the medical literature now brought to light—including as it did the more important works of Hippocrates and Galen, many of them hitherto unknown, and in addition, the forgotten element of Latin medicine, especially the work of Celsus—was in itself far superior to the second-hand compilations and incorrect versions which had formerly been accepted as standards. The classical works, though still regarded with unreasoning reverence, were found to have a germinative and vivifying power that carried the mind out of the region of dogma, and prepared the way for the scientific movement which has been growing in strength up to our own day.

The arrival of Galenic and Hippocratic medicine, though ultimately it conferred the greatest benefits on medical sciences, did not immediately produce any important salutary reform in practical medicine. The standard of excellence in the ancient writers was indeed far above the level of the 16th century; but the fatal habit of taking at second hand what should have been acquired by direct observation retarded progress more than the possession of better models assisted it, so that

the fundamental faults of mediæval science remained uncorrected. Nevertheless some progress has to be recorded, even if not due directly to the study of the ancient medicine. In the first place the 15th and 16th centuries were notable for the outbreak of certain epidemic diseases which were unknown to the old physicians. The spread of syphilis, a disease equally unknown to the ancients, and the failure of Galen's remedies to cure it, had a similar effect. In another direction the foundations of modern medicine were being laid during the 16th century—namely, by the introduction of clinical instruction in hospitals. Inspections of the dead, to ascertain the nature of the disease, were made, though not without difficulty, and thus the modern period of the science of morbid anatomy was ushered in. At the same time the discovery of new diseases, unknown to the ancients, and the keener attention which the great epidemics of plague caused to be paid to those already known, led to more minute study of the natural history of disease. The medicine of the early 17th century presents no features to distinguish it from that of the preceding century.

In looking back on the repeated attempts in the 18th century to construct a universal system of medicine, it is impossible not to regret the waste of brilliant gifts and profound acquirements which they involved. It was fortunate, however, that the accumulation of positive knowledge in medicine did not cease. While Germany and Scotland, as the chief homes of abstract speculation, gave birth to most of the theories, progress in objective science was most marked in other countries—in

Italy first, and afterwards in England and France. The reform of medicine in France must be dated from the great intellectual awakening caused by the Revolution, but more definitely starts with the researches in anatomy and physiology. The progress of medicine in England during this period displays the same characteristics as at other times, viz., a gradual and uninterrupted development without startling changes such as are caused by the sudden rise or fall of a new school. Darwin's work shows, however, the tendency to connect medicine with physical science, which was an immediate consequence of the scientific discoveries of the end of the 18th century, when Priestley and Cavendish in England exercised the same influence as Lavoisier in France. The English school of medicine also was profoundly stirred by the teachings of the two brothers William and John Hunter, especially the latter—who must therefore be briefly mentioned, though their own researches were chiefly concerned with subjects lying a little outside the limits of this sketch. William Hunter (1718-1783) was known in London as a brilliant teacher of anatomy and successful obstetric physician; his younger brother and pupil, John Hunter (1728-1793), was also a teacher of anatomy, and practised as a surgeon. His immense contributions to anatomy and pathology cannot be estimated here, but his services in stimulating research and training investigators belong to the history of general medicine. They are sufficiently evidenced by the fact that Edward Jenner and Matthew Baillie were his pupils. The same scientific bent is seen in the greater attention paid to

morbid anatomy (which dates from Baillie) and the more scientific method of studying diseases. Of the other countries of Europe, it is now only necessary to mention Germany. Here the chief home of positive medicine was still for a long time Vienna, where the "new Vienna school" continued and surpassed the glory of the old. In recent times the positive bent of modern knowledge and methods in other spheres of science and thought, and especially in biology, has influenced medicine profoundly. Minuter accuracy of observation was inculcated by the labors and teaching of the great anatomists of the 17th century; and, for modern times, experimental physiology was instituted by Harvey, anatomy having done little to interpret life in its dynamic aspects.

The character of modern medicine cannot be summed up in a word, as, with more or less aptness, that of some previous periods may be. Modern medicine, like modern science, is as boldly speculative as it has been in any age, and yet it is as observant as in any naturalistic period; its success lies in the addition to those qualities of the method of verification; the fault of previous times being not the activity of the speculative faculty, without which no science can be fertile, but the lack of methodical reference of all and sundry propositions, and parts of propositions, to the test of experiment. In no department is the experimental method more continually justified than in that of the natural history of disease, which at first sight would seem to have a certain independence of it and a somewhat exclusive value of its own. Hippocrates had no oppor-

tunity of verification by necropsy, and Sydenham ignored pathology; yet the clinical features of many but recently described diseases, such, for example, as that named after Graves, and myxœdema, both associated with perversions of the thyroid gland, lay as open to the eye of physicians in the past as to our own. Thus it was, partly because the habit of acceptance of authority, waning but far from extirpated, dictated to the clinical observer what he should see; partly because the eye of the clinical observer lacked that special training which the habit and influence of experimental verification alone can give, that physicians, even acute and practiced physicians, failed to see many and many symptomatic series which went through its evolutions conspicuously enough, and needed for its appreciation no unknown aids or methods of research, nor any further advances of pathology. We see now that the practice of the experimental method endows with a new vision both the experimenter himself and, through his influence, those who are associated with him in medical science, even if these be not themselves actually engaged in experiment; a new discipline is imposed upon old faculties, as is seen as well in other sciences as in those on which medicine more directly depends. And it is not only the perceptons of eye or ear which tell, but also the association of concepts behind these adits of the mind. It was the concepts derived from the many experimental methods of earnest investigators which brought about new facilities for necropsies, also discoveries in morbid anatomy and histology began to pile upon us, thereby creating an awakening of new

thought. If at first in the 18th century, and earlier 19th, the discoveries in this branch of medical knowledge had a certain isolation, due perhaps to the prepossessions of the school of Sydenham, they soon became the property of the physician, and were brought into coördination with the clinical phenomena of disease. The great Morgagni, the founder of morbid anatomy, himself set the example of carrying on this study parallel with clinical observation; and always insisted that the clinical story of the case should be brought side by side with the revelations of the necropsy. In pathology, indeed, Virchow's (1821-1902) influence in the transfiguration of this branch of science may almost be compared to that of Darwin and Pasteur in their respective domains. In the last quarter of the 19th century the conception grew clearer that morbid anatomy for the most part demonstrates disease in its static aspects only, and also for the most part in the particular aspect of final demolition; and it became manifest as pathology and clinical medicine became more and more thoroughly integrated, that the processes which initiate and are concerned in this dissolution were not revealed by the scalpel.

Again, the physician as naturalist, though stimulated by the pathologist to delineate disease in its fuller manifestations, yet was hampered in a measure by the didactic method of constructing "types" which should command the attention of the disciple and rivet themselves on his memory; thus too often those incipient and transitory phases which initiate the paths of dissolution were missed. Not only so, but the physician, thus

fascinated by the "types," and impressed by the silent monuments of the pathological museum was led to localize disease too much, to isolate the acts of nature, and to forget not only the continuity of the phases which lead up to the exemplary forms, or link them together, but to forget also that even between the types themselves relations of affinity must exist—and these often times none the less intimate for apparent diversities of form, for types of widely different form may be, and indeed often are, more closely allied than types which have more superficial resemblance—and to forget, moreover, how largely negative is the process of abstraction by which types are imagined. Upon this too static a view, both of clinical type and of post-mortem-room pathology, came a despairing spirit, almost of fatalism, which in the contemplation of organic ruins lost the hope of cure of organic diseases. So prognosis became pessimistic, and the therapeutics of the abler men negative, until fresh hopes arose of stemming the tides of evil at their earliest flow.

Such was medicine, statically ordered in pathology, statically ordered in its clinical concepts, when, on the 24th of November 1859, the *Origin of Species* was published. It is no exaggeration to say that this epoch-making work brought to birth a world of conceptions as new as the work of Copernicus. For the natural philosopher the whole point of view of things was changed; in biology not only had the anthropocentric point of view been banished, but the ancient concept of perpetual flux was brought home to ordinary men, and entered for good into the framework of

thought. Before Darwin—if the name of Darwin might be used to signify the transformation of thought of which he was the chief artificer—natural objects were regarded, not in medicine and pathology only, as a set of hidebound events; and natural operations as moving in fixed grooves, after a fashion which it is now difficult for us to realize. With the melting of the ice the more daring spirits dashed into the new current with such ardor that for them all traditions, all institutions were thrown into hotchpot; even elderly and sober physicians took enough of the infection to liberate their minds, and, in the field of the several diseases and in that of post-mortem pathology, the hollowness of classification by superficial resemblance, the transitoriness of forms, and the flow of processes, broke upon the view. Thus it came about not only that classifications of disease based on superficial likeness—such as jaundice, dropsy, inflammation—were broken up, and their parts redistributed, but also that even more set diseases began to lose settlements, and were recognized as terms of series, as transitory or culminating phases of perturbations which might be traced to their origins, and in their earlier stages perhaps withstood. The doctrine of heredity in disease thus took a larger aspect; the view of morbid series was no longer bounded even by the life of the individual; and the propagation of taints, and of morbid varieties of man, from generation to generation proved to be no mere repetition of fixed features but even more frequently, to be modes of development or of dissolution betraying themselves often in widely dissimilar

forms, in series often extending over many lives, the terms of which at first sight had seemed wholly disparate. Thus, for example, as generations succeed one another, nervous disorders appear in various guise; epilepsy, megrim, insanity, asthma, hysteria, neurasthenia, a mottley array at first sight, seemed to reveal themselves as terms of a morbid series; not only so, but certain disorders of other systems also might be members of the series, such as certain diseases of the skin, and even peculiar susceptibilities or immunities in respect of infections from without. On the other hand, inheritance was dismissed, or survived only as a "susceptibility," in the case of tuberculosis, leprosy and some other maladies now recognized as infectious; while in others, as in syphilis, it was seen to consist in a translation of the infectious element from parent to offspring. These new conceptions of multiplicity in unity of disease, and of the fluidity and continuity of morbid processes, might have led to vagueness and over-boldness in speculation and reconstruction, had not the experimental method been at hand with clues and tests for the several series. Of this method the rise and wonderful extension of the science of bacteriology also furnished no inconsiderable part.

Meanwhile Cohnheim and Metchnikoff were engaged in destroying the ontological conception not of fever only, but also of inflammation, of which, as a local event, an ontological conception was no less strongly implanted. By his researches on the migration of the white corpuscles of the blood Cohnheim, on the bases laid by Virchow, brought the process of inflammation within the

scope of the normal, seeing in them but a modification of normal processes under perturbations of relatively external incidence; even the formation of abscess was thus brought by him within the limits of perversion of process not differing essentially from those of health; and "new formations," "plastic exudations," and other discontinuous origins of an "essential" pathology, fell into oblivion.

Discovery in these various directions then led physicians to regard fever and inflammation not as separable entities, but as fluctuating symptom-groups, due to swervings of function from the normal balance under contingent forces. As to such reforms in our conceptions of disease the advances of bacteriology profoundly contributed, so under the stress of consequent discoveries, almost prodigious in their extent and revolutionary effect, the conceptions of the etiology of disease underwent no less a transformation than the conceptions of disease itself. It is proper to point out here how intimately a pathology thus regenerated modified current conceptions of disease, in the linking of disease to oscillations of health, and the regarding many diseases as modifications of the normal set up by the impingement of external causes; not a few of which indeed may be generated within the body itself—"autogenetic poisoning." The appreciation of such modifications, and of the working of such causes, has been facilitated greatly by the light thrown upon normal processes by advances in physiology; so dependent is each branch of knowledge upon the advances of contiguous and incident studies.

To biological chemistry we have been deeply indebted during the latter half of the 19th century. In 1872, Hoppe-Seyler (1825-1895) gave a new beginning to our knowledge of the chemistry of secretion and of excretion; and later students have increased the range of physiological and pathological chemistry by investigations not only into the several stages of albuminoid material and the transitions which all food-stuffs undergo in digestion, but even into the structure of protoplasm itself. Digestion, regarded not long ago as little more than a trituration and "coction" of ingesta to fit them for absorption and transfer them to the tissues, now appears as an elaboration of peptones and kindred intermediate products which, so far from being always bland, and mere bricks and mortar for repair or fuel for combustion, pass through phases of change during which they become so unfit for assimilation as to be positively poisonous. The formation of prussic acid at a certain period of the vital processes of certain plants may be given as an example of such phases; and poisons akin to muscarin seem to arise frequently in development or regression, both in animals and plants. Thus the digestive function, in its largest sense, is now seen to consist, not only in preparation and supply, but in no small measure also of protective and antidotal conversions of the matters submitted to it; coincidently with agents of digestion proper are found in the circuit of normal digestion "anti-substances" which neutralize or convert peptones in their poisonous phases; an autochthonous ferment, such as rennet for instance, calling forth an anti-rennet, and

so on. Now as our own bodies thus manipulate substances poisonous and antidotal, if in every hour of health we are averting self-intoxication, so likewise are we concerned with the various intruding organisms, whose processes of digestion are as dangerous as our own; if these destructive agents, which no doubt are incessantly gaining admission to our bodies, do not meet within us each its appropriate compensatory defensive agent, dissolution will begin. Thus, much of infection and immunity are proving to be but special cases of digestion, and teleological conceptions of protective processes are modified.

Under the name of chemotaxis (W. Pfeffer) are designated certain of the regulative adaptations by which such ends are attained. By chemical warnings the defensive processes seem to be awakened, or summoned; and when we think of the infinite variety of such possible phases, and of the multitude of corresponding defensive agents, we may form some dim notion of the complexity of the animal blood and tissues, and within them of the organic molecules. Even in normal circumstances their play and counterplay, attractive and repellent, must be manifold almost beyond conception; for the body may be regarded as a collective organization consisting of a huge colony of microörganisms become capable of a common life by common and mutual arrangement and differentiation of function, and by toleration and utilization of each other's peculiar products; some organs, such as the liver, for example, being credited with a special power of neutralizing poisons, whether generated under normal condi-

tions or under abnormal, which gain entrance from the intestinal tract. As a part of these discoveries has arisen another but kindred doctrine, that of hormones (Starling), or those juices prepared (within the body of every individual), not for excretion, not even for partial excretion, but for the fulfillment of physiological equilibrium. Thus the reciprocity of the various organs, maintained throughout the divisions of physiological labor, is not merely a mechanical stability; it is also a mutual equilibration in functions incessantly at work on chemical levels, and on those levels of still higher complexity which seem to rise as far beyond chemistry as chemistry beyond physics. Not only are the secreted juices of specialized cells thus set one against another in the body, whereby the various organs of the body maintain a mutual play, but the blood itself also in its cellular and fluid parts contains elements potent in the destruction of bacteria and of their secretions. Thus endowed, the blood, unless overwhelmed by extraordinary invasions, does not fail in stability and self-purification. So various are the conditions of self-regulation in various animals, both in respect of their peculiar and several modes of assimilating different foods, and of protecting themselves against particular dangers from without, that, as we might have expected, the bloods taken from different species, or even perhaps from different individuals, are found to be so divergent that the healthy serum of one species may be, and often is, poisonous to another; not so much in respect of adventitious substances, as because the phases of physiological change in different species

do not harmonize; each by its peculiar needs has been modified until, in their several conditions of life, they vary so much about the mean as to have become almost if not quite alien one to another.

In the preservation of immunity then, in its various degrees and kinds, not only is the chemistry of the blood to be studied, but also its histology. By his eminent labors in cellular pathology, Virchow, and Metchnikoff later, gave the last blow to the mere humoral pathology which, after an almost unchallenged prevalence for some two thousand years, now finds a resting-place only in our nurseries. Now the cellular pathology of blood, investigated by the aid of modern staining methods, is as important as that of the solid organs; no clinical investigator—indeed, apart from research, no practitioner at this day—can dispense with examination of the blood for purposes of diagnosis; its coagulability and the kinds and the variations of the cells it contains being evidence of many definitely morbid states of the body. Again, not only in certain diseases may strange cells be found in the blood (*e. g.* in myelogenic leucæmia), but parasites also, both in man, as those of malaria, of sleeping sickness, of kala-azar, and in animals, as redwater, and Texas fever, have been discovered, to the great advantage of preventive medicine. For some of these, as redwater (pyrosoma), antidotes are already found; for others, as for Texas fever—of which the parasite is unknown, but the mode of its transmission, by the mosquito, discovered (Finlay-Reed)—preventive measures are reducing the prevalence.

It is obvious that the results of such advances prescribe for the clinical physician methods which cannot be pursued without expert assistance; a physician engaged in busy practice cannot himself undertake even the verifications required in the conduct of individual cases. Skill in modern laboratory work is as far out of the reach of the untaught as performance on a musical instrument. In spite, therefore, of the encyclopedic tradition which has persisted from Aristotle through the Arab and mediæval school down to Herbert Spencer, it is forced upon us in our own day that in a pursuit so many-sided as medicine, whether in its scientific or in its practical aspect, we have to submit more and more to that division of labor which has been a condition of advance in all other walks of life. It is now fully recognized that diseases of infants and children, of the insane, of the generative organs of women, of the larynx, of the eye have been brought successively into the light of modern knowledge by "specialists," and by them distributed to the profession; and that in no other way could this end have been attained. That the division of labor, which may seem to disintegrate the calling of the physician, really unites it, is well seen in the clinical laboratories which were initiated in the later 19th century, and which are destined to a great future. By the approach of skilled pathologists to the clinical wards, a link is forged between practitioners and the men of science who pursue pathology disinterestedly. The first clinical laboratory seems to have been that of Von Ziemssen (1829-1902) at Munich, founded in 1885; and, although his example has not yet

been followed as it ought to have been, enough has been done in this way, to prove the vital importance of the system to the progress of modern medicine.

That the methods and the subject-matter of surgery and of medicine are substantially the same, and that the advance of one is the advance of the other, the division being purely artificial and founded merely on accidents of personal bent and skill, must be insisted upon at this time of our history. The distinction was never a scientific one, even in the sense in which the word science can be used of the middle ages; it originated in social conceits and in the contempt for mechanical arts which came of the cultivation of "ideas" as opposed to converse with "matter," and which, in the dawn of modern methods, led to the derision of Boyle by Oxford humanists as one given up to "base and mechanical pursuits." Had physicians been brought into contact with facts as hard as those faced by the surgeons of the 16th century their art would not have lain so long in degradation. It is under this closer occupation with mechanical conditions that surgery today is said—not without excuse, but with no more than superficial truth—to have made more progress than medicine. Medicine and surgery are but two aspects of one art; Pasteur shed light on both surgery and medicine, and when Lister, his disciple, penetrated into the secrets of wound fevers and septicæmia, he illuminated surgery and medicine alike, and, in the one sphere as in the other, coöperated in the destruction of the idea of "essential fevers" and of inflammation as an "entity." Together, then,

with the necessary multiplication of specialism, one of the chief lessons of the latter moiety of the 19th century was the unity of medicine in all its branches—a unity strengthened rather than weakened by special researches, such as those into "medical" and "surgical" pathology, which are daily making more manifest the absurdity of the distinction. Surgeons, physicians, oculists, laryngologists, gynæcologists, neurologists and the rest, all are working allotments of the same field, and combining to a common harvest.

While pathology then, which is especially the "science of medicine," was winning territory on one side from physiology, of which in sense it is but an aspect, and on another by making ground of its own in the post mortem room and museum of morbid anatomy, and was fusing these gains in the laboratory so as to claim for itself, as a special branch of science by virtue of peculiar concepts, its due place and provision—provision in the establishment of chairs and of special laboratories for its chemical and biological subdivisions—clinical medicine, by the formal provision of disciplinary classes, was illustrating the truth of the experience that teaching and research must go hand-in-hand, the one reinforcing the other; that no teacher can be efficient unless he be engaged in research also; nay, that for the most part even the investigator needs the encouragement of disciples. Yet it was scarcely until the last quarter of the 19th century that the apprenticeship system, which was a mere initiation into the art and mystery of a craft, was recognized as antiquated and, in its virtual exclusion of academic study,

even mischievous. In place of it, systematic clinical classes have become a part of the scheme of every efficient school of medicine. A condition of this reform was the need of a preliminary training of the mind of the pupil in pure science, even in physics and chemistry; that is to say, before introduction into his professional studies. The founding of new teaching universities, in which England, and even France, had been at some disadvantage as compared with Scotland and Germany, strengthened the movements in favor of enlarging and liberalizing technical training, and of anticipating technical instruction by some broader scientific discipline; though as in all times of transition, something was lost temporarily by a departure from the old discipline of the grammar school before a new scheme of training the mind in scientific habits and cenceptions was established or fully apprehended. Yet on the whole, even from the beginning, the revolt was useful in that it shook the position of the "learned physician," who took a literary, fastidious and meditative rather than an experimental interest in his profession, and, as in great part a descendant of the humanists, was never in full sympathy with experimental science.

At the risk to doubt of some defects of culture, the newer education cleared the way for a more positive temper, awoke a new sense of accuracy and of verification, and created a skeptical attitude towards all conventions, whether of argument or of practice, among the drawbacks of this temper, which on the whole made for progress, was the rise of a school of excessive skepticism, which, for-

getting the value of the accumulated stores of empiricism, depised those degrees of moral certainty that, in so complex a study and so tentative a practice as medicine, must be our portion for the present, and even for a long future, however great the triumphs of medicine become. This skepticism took form in the school, most active between 1860 and 1880, known as the school of "Expectant Medicine." These teachers, genuinely touched with a sense of scantiness of our knowledge, of our confidence in abstract terms, of the insecurity of our alleged "facts," case-histories and observations, alienated from traditional dogmatisms and disgusted by meddlesome polypharmacy —enlightened, moreover, by the issue of cases treated by means such as the homœopathic, which were practically "expectant"—urged that the only course open to the physician, duly conscious of his own ignorance and of the mystery of nature, is to put his patient under diet and nursing, and, relying on the tendency of all equilibriums to recover themselves under perturbation, to await events.

But to sit down helpless before human suffering is an unendurable attitude. Considering the earth as a material thing; also, that the human body is a material thing; that microörganisms are material things; also their toxins (poisons produced by the energy of microörganisms) are material things; that diseases or pathological conditions known as tuberculosis, syphilis, gonorrhea, small pox, typhoid fever, diphtheria, pneumonia, and many more are material things; that individual immunity or individual susceptibility, to

certain diseases, are material things, we will proceed. Taking for granted, that all of the above are facts, necessary to the production and sustaining of life, also, that these same facts are necessary to the maintenance of a condition of wellbeing, in the human, as well as being involved in the producing of any disease process; it is obvious, that there must be an earth to produce a something which will produce and sustain a human, and there must be both, a human and microörganisms to produce a disease; the material things involved in the question of immunity and susceptibility, playing the greatest part, in the progress of a disease of (when viewed from another point) the many processes on the part of the individual—or on the part of nature—to combat a disease, thereby bringing about the abatement of, and sometimes, the prevention of a disease, in the average human being.

Then it is reasonable to assume, that those things of which the earth is composed, are the things which support the human, and are also the primary factors in the production of all life, including the human and microörganisms; that the properties for the reproduction of the human,—in this known continuous cycle of human life—are found within the human; that the properties for the reproduction of microörganisms,—in this known continuous cycle of bacterial life—are found within these microörganisms themselves.

The existence of all things in our material world,—with its apparently never-ending cause and effect upon all life and its constant prepara-

tion in its cycle of procreation and creation, anti-function and function, production and reproduction, action and reaction, and its ultimate termination, our so-called death, but which we may ultimately learn, may or may not be, either, a reduction to ultramicroscopic bodies of a solid and animate nature, or a condensation to atoms of a gaseous and animate nature—is dependent upon some fundamental principle of an unknown power or source, which according to science, is many hundreds of thousands of years old in its process of evolution.

Science has taught us that all things of any importance to man and great things created by achievement of man, all of which go to make up the wonders of our modern world, were—at one time or another in their original existence or form—essentially of a minute and individual composition in size and character, known as the primary elements. Beginning at this point as a starting place, all things—through the persistence of man—in their many forms of construction created by man have come into existence each playing its part of subservience in the life of its maker. By the acquiring of knowledge and by instituting a system of training man has learned the means and methods whereby these elements in their original minute forms may be broken up and again brought together in a process of construction in many different combinations; at first—in the prehistoric period—confining his efforts to those things which were of a useful character, necessary to his existence and the preservation of life. Later came the essential combined with the practi-

cal and a tendency toward convenience, and still later came the blending of art and beauty with the convenience, of those practical and essential things in the daily life of man.

It is only of late years that man has reflected upon the former achievements of his ancestors and the many inventions of modern times. The question of, the how, the when and where,—of all these one time dreams now produced in practical possibilities—has dawned upon him. Hence, our world of today is the beginning of the period, from whence shall come the answer, and will probably be known in the future as the age or period of "scientific research."

The time has come when man is no longer satisfied to remain dormant in ignorance and stupidity of indifference, accepting all things as they come and taking all things for granted, asking no questions as to their origin, as in former years our ancestors were wont to do; today man asks questions as to the why and wherefore of everything. In the undertaking of solving these problems, man has discovered that it is no small task and requires a systematic investigation. This process is now in the making and demands as a first procedure that we go back as far as possible and learn something of the early life of man and if possible of primitive man and his life upon earth. In retracing the steps of our ancestors and delving into the secret of the origin of man, we have just about reached the end of our journey.

Having arrived at "the beginning of the end" of our destination, we are hampered on all sides; being surrounded and confronted by many op-

posing forces which take on the guise of giant monsters—rising as specters in the near distance—whose huge forms and menacing attitude cast a depressing shadow over all humanity. These forms—compositions of ignorance, greed for gold, lust of the body, race hatred, religious fanaticism, misrepresentation, suppression of truth, promotion of war, acquisition of power and political intrigue—apparently bar the way to all investigation of current erroneous propaganda and false statements of unfounded worth, now being propounded and circulated (at all times, more or less) throughout the entire world.

With the event of the microscope in the seventeenth century,—when Antony Van Leewenhoeck, sometimes called the father of microscopy, succeeded in producing a fairly good instrument—and with its later improvements of up-to-date perfection, there was revealed unto man a new and strange world of minute bodies, composing the organic and inorganic life, existing in the air, on the earth and in the sea. Thus did man begin the study of all nature's intimate construction and activity; a few of these studies are, Geology, with its many minerals; Chemistry, showing its compositions and combinations, crystals and diatones with their numerous and strange formations; Bacteriology, demonstrating animalcule life in its extensive forms and characteristics; Pathology, showing the many abnormal changes produced by diseases which take place in the different organs in the body of man and the lower animals; Histology, which discloses the normal minute constructive features; fish and shell life of the sea and

birds of the air, as well as the many organs and other structures of man and the lower animals.

In the past few years medical science has demonstrated several instances where we can test, by different methods (with comparitively accurate deductions) many individuals as to their relative immunity or susceptibility to certain diseases,—vaccination in small pox and the Schick test for diphtheria—however, there are some who will not react to these tests. The many reasons, as to the whys and wherefores, as to some individuals being almost entirely immune from certain diseases and others being, to a marked degree, very susceptible to certain diseases, and why it is that some individuals will react, while others will not react, to these tests when made, have never been explained to any marked degree of satisfaction.

This brings us to the first point of the basis of our theory. It is quite possible that these mysterious and ultramicroscopic "granules or minute bodies," the so-called hormones, enzymes or ferments, are really responsible (in their composition or action or both) for either the susceptibility to a disease or the immunity from a disease; they apparently being composed of an all-important and quadruple manifold force or latent energy involving and controlling the general health, from a heredity standpoint, conferring upon the individual a positive or negative resistance to disease; this includes, infections from all kinds of bacteria, the destruction of these parasitic invaders and the neutralizing of their toxins; thereby avoiding any material damage to the solid and fluid tissues of the body; as a result of this resistance or immunity

—when present—the individual is protected from any secondary complication, leading to a serious disease or a truly pathological condition.

The second point deals with the growth of the individual, not alone the actual growth but control of the development as well, in every case; the bones will take the proper course, correct shape and normal consistency, from infancy to manhood or womanhood; the muscles will assume their proper tonicity, proportion and contour, especially the general outline of the male or female in relation to the hips and breast, each having its mark of masculine or feminine development at the proper time and age, corresponding with the normal physiological changes peculiar to each sex. These two factors of growth and development when properly controlled will give to the male, what we call a wonderful physique and to the female a beautiful figure. In either case there is generally the handsome or beautiful accompanying the symmetrical outline of masculinity or femininity, always so pleasing to the eye and coveted by every human being.

Let us consider vegetation of plant-life in the aggregate, its many branches of study, its various forms of life, its development from a minute seed in many instances, its structure in color, contour, consistency and size, with its several modes of function, selecting for example two of the most common forms in the vegetable kingdom; the flower with its many tints and large variety of color display (in its wild or cultivated state), with its countless thousands of forms and shapes of growth; the tree in its wide diversity of indi-

vidual characteristics, especially as to consistency, contour and size, giving to each of its species or the different groups a well recognized and truly marked distinctness, whereby it may be known at once, when found among a group of strangers who are indeed its brothers and sisters.

All evidence points to the fact that this continuous cycle of reproduction and growth has gone on and on, year after year for many hundreds of years, perhaps thousands of years, in its vegetative existence or its life of monotonous and passive development; surely there must be a something of much importance, somewhere, to control it; a fundamental principle or law to govern all this comparatively regulated system of wonderous development and reproduction and its continual repetition, on and on through the ages. The question which confronts us primarily is; what united force or what group of factors were responsible in the instigation of the framing, passing and fixing of this law; secondarily, what are and when came these preliminary essential elements of yesterday and today which continue to guide, control or abide by, this apparently fixed law. This is a positive every day visible and vitalized existence and the material manifestations of reproduction and development in our plant-life, with its regulation or standarization or its almost absolute conformity to a definite and precise characteristic, whereby it may be easily distinguished, as to size, shape and consistence.

It has been said, "tall oaks from little acorns grow" but is the acorn the primary or secondary factor or just the intermediate agent; perhaps it

is the worldly evidence in the third or fourth stage of the cycle of reproduction, in this particular form of vegetative life. Should we grant the concession that the acorn contains all the essential elements to produce the oak-tree; here we are again confronted with the question; from where and whence came these elements, contained within the acorn? Is there any more plausible theory or answer, than to assume that these elements—which make and control the growth, size, shape and consistency—are nothing more or less than hundreds of millions of ultramicroscopic "minute bodies" (produced by the parent oak-tree and incorporated within the acorn, by this hidden process or this apparently fixed law) or essential "granules" on the same order as the so-called hormones or enzymes, as produced and found in the human.

Therefore we may say, nowhere is there "nothing"—or,—"something" is everywhere, relatively speaking, in the form of solids, liquids and gases which may be considered as "matter and mass." In a vacuum "nothing" could exist, in the form of life, from the fact that a vacuum is "nothing" as perceptible to one or more of the five senses, and a vacuum does not "exist" except in rare instances, and this actual or relative existence only conceivable to the mind. Again we find, more explicity written in the Latin, "de nihilo nihilum, in nihilum nil posse reverti." (From nothing nothing, into nothing nothing can return.)

WHERE (HUMAN) LIFE BEGINS IN THE HUMAN.
(As man understands it today)

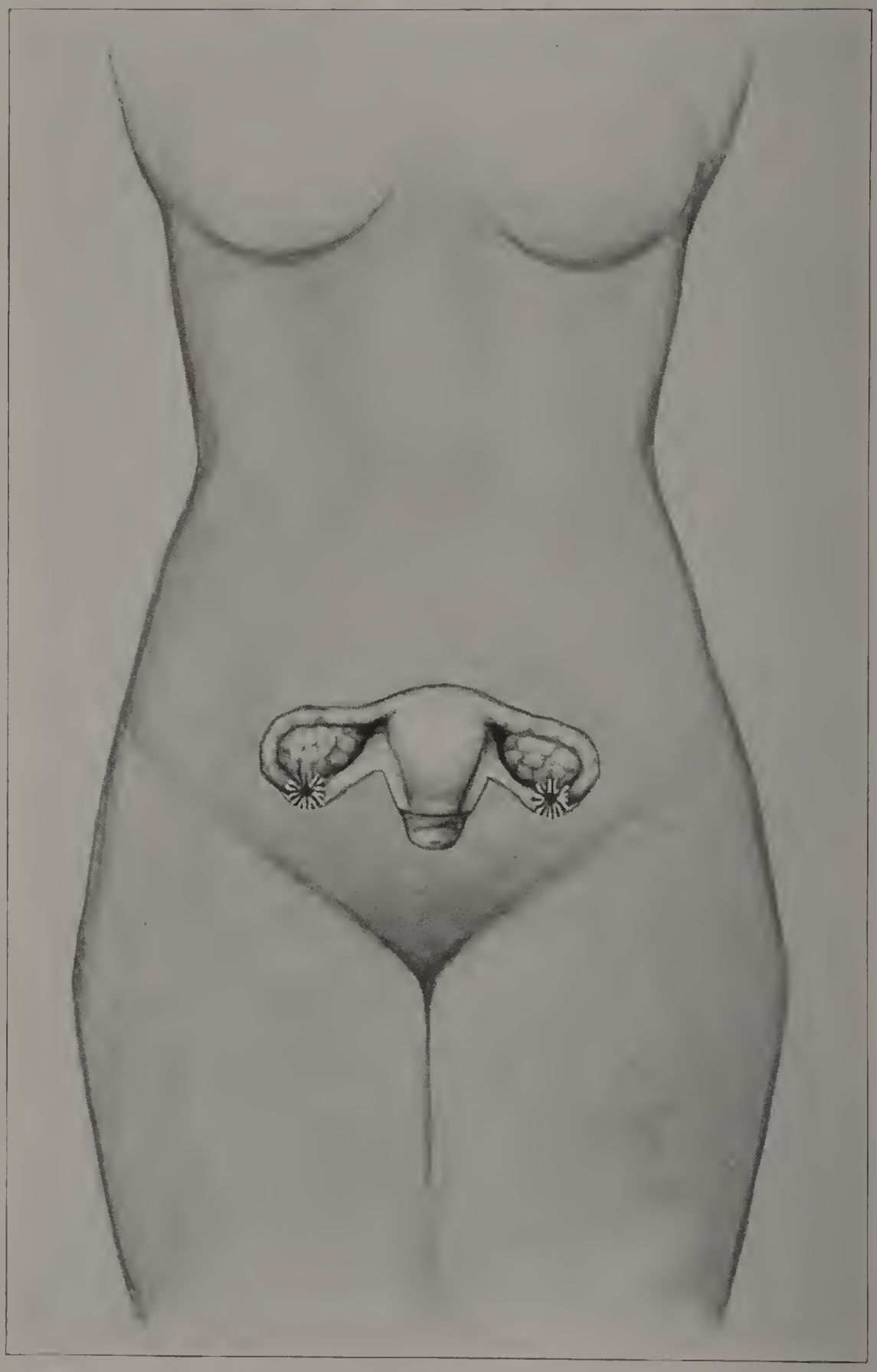


FIG. 7. Schematic drawing showing front view of the nongravid uterus (nonpregnant womb) before conception takes place.

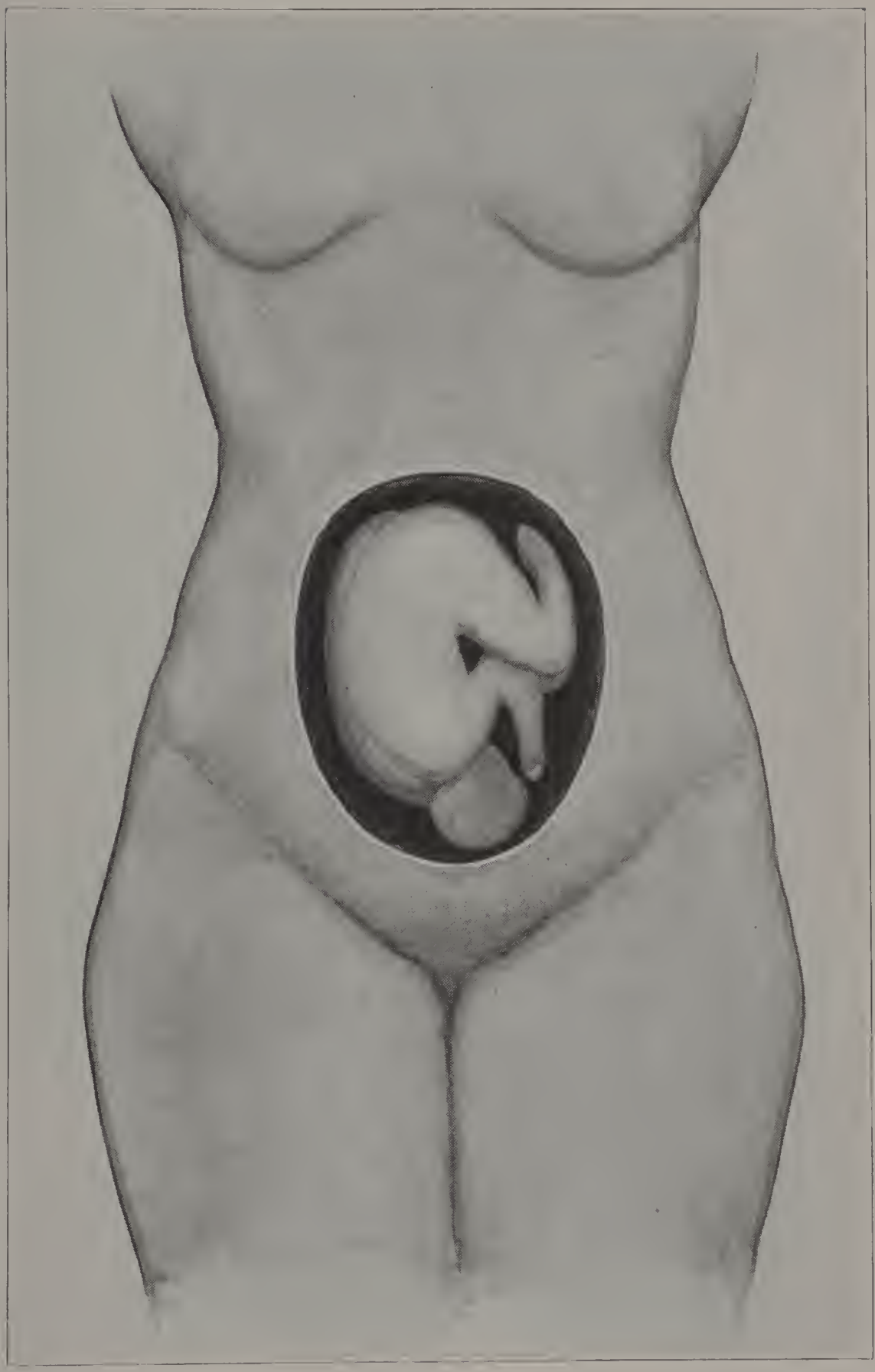


Fig. 8. Schematic drawing showing front view of the gravid uterus (pregnant womb) about ten lunar months after conception has taken place. (Child about to be born.)

CHAPTER XIX

THE THEORY

"Ex pede Herculem"

(From the foot we may recognize Hercules, or, from a part of a thing we may infer the whole.)

THE ultimate road in any instance which leads to success—when found—is usually found to be paved with a positive and the necessary element of purpose; that element being composed mostly of endurance and efficiency. It is in this efficiency that the success of the general practitioner or specialist, in the practice of medicine, is found today; therefore, the basis or one of the essential factors for success in medicine lies in research work. It may be said, with much truth; without research work no authoritative works have been written, no scientific discoveries made nor practical inventions brought about. Considering these facts and with the promotion of medical science in mind, we must add the primary factor of the whole; "the theory conceived," of anything, was ever the beginning. That is to say, in accordance with the known history, as found in the annals of man's work, the physical endurance ever played its part.

If it is true, that the primary and ultimate function of the human being while upon earth,—when all is said and done,—can be summed up in these few words: "we are here as a result of a process of reproduction and our function is to

reproduce our kind and then pass on, thereby perpetuating the human race," or "it is the keeping in motion the perpetual cycle of the human life," then this is, apparently, true of all other living things which come into existence, to-wit: to reproduce its kind and die. If this is true,—in accordance with science,—we may then proceed to give an illustration of an instance or a phase, of this continuous or never ending cycle, of the human life. It is a rather difficult matter to select a starting point or a specific place with which to begin, especially when this instance or phase or part played in this endless cycle, is that of a single individual or being,—but as all things must have had a beginning, sometime and somewhere, and as all things material do have a beginning (as we know them), in accordance with science—we must begin somewhere and at a given point; so it happens that our choice (as to time and place) falls upon the female at the age of womanhood and after conception has taken place, it being no doubt, the most significant instance in the life cycle of the human race.

If it is true, that the gonads or so-called interstitial glands—the reproductive glands of the male and female—are intimately related and connected by the blood stream with a group or chain of glands, known to us as the "endocrine" glands; and if, the life, function and product of these gonads are: first, molded into an original specific form and consistency—during the early embryonic stage, or, in the course of development (before the individual is born) in intra-uterin life—by an unknown action on the part of the other glands of

this group, thereby granting these gonads the powers or the qualifications of producing a male or female element when this individual arrives at the age of puberty,—which later plays its part in the act of reproduction—and all through life these other glands and their products are essential to the function and production of the gonads; and second, the functions of the gonads guided and regulated by these other glands, signifying the changes or the different cycles which take place in the life of every individual; to-wit, the affinity, desire, inclination and consent—on the part of the female—leading to conception or pregnancy, resulting in the termination of the monthly period for a limited time; the unknown force which compels the uterus to empty itself or causes the expulsion of the full term child into the outer world; the involution or contraction of that same uterus, causing it to again resume its original or natural size—or practically so—almost immediately after the child is born; the preparation of this same uterus for a repetition of its function; the hidden process of preparation of food for the new-born, in the mammary glands of the mother—a perfect "emulsion" which science has failed to duplicate —because the infant is positively a truly helpless creature; the change from infancy to childhood, from childhood to the age of puberty—when a cycle of change takes place within a cycle of change—from puberty to senility, then death and the change from flesh and blood to the apparently ultimate termination of all life—in time—the ultramicroscopic "granules;" third, the comparatively unknown process which takes place at the

time of conception, when unaided and unseen the products of the gonads—one male and one female element combine to produce the human—perform their function of propagation, being at all times, apparently, aided or hindred, in a material way (as the case may be), in the primary stage of fertilization, the secondary stage or formation of placenta and embryo, terminating in the tertiary stage, the production and delivery of a comparatively perfect and live child; then it is surely the result of the work done by these other glands of the same group, by way of the blood stream, this same blood stream being alone responsible—in a primary way—for the sole nutrition, formation of structures and all features during growth, and delivery of the human infant at full term. Taking it for granted that the mother has the proper amount of good food and care.

If it is true, that the products of the "Endocrine" glands—the hormones or enzymes or ferments—have by way of the blood stream, a material effect upon the gonads of both male and female, it is quite possible that these products, of the other glands in this group, will surely have a tendency to regulate and influence the function of these gonads; then it is reasonable that all these other glands in this chain (or their products when thrown into the blood stream) will also tend to give to the products of the gonads (the spermatozoa of the male and the ovum of the female) its essential needs, in contour, construction and consistency, also its nature and characteristics in general; these things would involve; first, the production and development of the female element

(the ovum) and its ability to find its way from its source which is the ovary, to its final resting place, in the uterus, and its hidden process of preparation to receive the male element (the spermatozoa) when it becomes fertilized and conception takes place; second, the production and development and the maintenance of the life and function of the male element (the spermatozoa) and its ability to find its way from its source (the testis) to its destination (the ovum) and its hidden power or desire to seek the ovum with its known force and admitted power of locomotion and its ability to find the point of entrance, and when found, pierce or force its way into the ovum, or in some way become amalgamated with the ovum, thereby completing conception. All of this takes place unseen and unaided from the outside world, or without material assistance of human mind or hand; it is just nature's automatic procedure.

It is apropos, at this time and place to state; that any alternation in, or interference with, these several factors involving the construction and consistency of these reproductive elements—the ovum after finding its way to the uterus and becoming impregnated in the female, the development of the ovum while contained within the ovary, before being discharged to perform its several functions; and these same circumstances could prevail relative to the spermatozoa in the male—would no doubt have a detrimental effect upon these reproductive elements to the extent of interfering with or changing the normal functions, of these reproductive elements of either the ovum or the spermatozoa, in one or both instances, (of these repro-

ductive elements) making one or both elements incompetent of its requirements, perhaps causing it to be inert or lifeless; it is reasonable to assume that this interference would be in some instances, the cause of malformation (on the part of the unborn child, due to interference with is development) in the new-born, and possibly in other instances it may be a just cause for sterility, in the male or female or both. Akin to this particular point or phase in our cycle of human life, it may be said; could it be possible to demonstrate, from any angle, that these "hormones" or "minute bodies" are the true factors, dominating the construction and composition of these reproductive elements (the ovum and spermatozoa), it would surely open the way into new fields for scientific investigation.

Any forthcoming proof that, these "hormones" or "minute bodies" are indeed the most important factors and are truly responsible for the primary construction and development of these reproductive elements (if it is true of the male it may be assumed, it is also true of the female and vice versa; the spermatozoa while passing through its several stages of evolution, on its way to perfection and before leaving the testis; the ovum during its course of growth and evolvement before leaving the ovary), may be had or such evidence made possible by investigation of the question from two entirely different views; first, to prove or disprove that every individual when born into the world, is endowed with these "hormones" or "minute bodies," which are more or less coalescent, they being contained within the reproductive elements

which are in turn embodied within the ovary and the testis; second, to prove or disprove that these "hormones" or "minute bodies" are supplied by the other endocrine glands, being brought to a nucleus of the ovum and the spermatozoa (by way of the blood-stream) or a minute cell, contained within the ovary or testis and taken up by them, thereby devoting much to their gradual completion. If either of these two views were proven to be true of the male element, it could then be assumed, that the same conditions hold true relative to the female element and vice versa. The point of real significance being, to prove the power or influence of these "hormones" or "minute bodies" (produced in the other endocrine glands) and the nature of this power or influence, upon the male element (the spermatozoa) or upon the female element, the ovum.

If it is true, that the life of the human being,—from the moment of conception, and all through intra-uterine life, until born into the world and then on throughout its human existence—is dependent upon this life through the generosity, or the proper functioning of the "endocrine glands" which produce the "internal secretions" in which are contained numerous "minute bodies" or "granules" or the so-called "hormones," or, "enzymes," or, "ferments;" these being a product produced through a system or method of stimulation and inhibition, and carried by way of the blood stream throughout the human body; and, if as a result of this proper function, system, or method, there is a continual evolution of some, and involution of others, of these same "endocrine glands"

(or the hormones produced by these glands) all intimately connected in the same group, and as a whole, all of these glands undergo a continual depreciation of these virtues and qualifications which maintain the vitality of youth, thereby tending to bring about old age; and, if this same group of glands will bestow upon each individual those faculties and virtues responsible for "personality," "health and strength," "handsome face and physique" in the male, or "beautiful face and figure" in the female, and giving to others the extraordinary intellectual mentalities, or, the physical properties which will withstand great physical and mental strain; and if this same group or chain of glands is at fault or to blame, for the ugly face and figure of some unfortunates, also for the plight of those individuals who are simple in mind (for instance, the different types of morons); and others who are deformed in body, or stunted in growth, some too tall and lean and some too short and fat; and if these same glands are responsible,—on account of too little in amount or too much in amount of production of the "internal secretions," or lack of function—for bringing about the many types of insanity, at the different periods of life; and, if these glands confer upon us our immunities and susceptibilities to disease by the powers possed in their internal secretions which neutralize or destroy all foreign bodies that would enter the human system, including all detrimental bacteria and their products; then it is reasonable to assume that the "substance produced" by the function of these glands—the internal secretions—is a product which contains

these "minute bodies"—the so-called hormones, or enzymes, or, ferments,—which also have a function, and if these "minute bodies" are sufficient in amount, normal in consistency and perform their function properly, all seems to go well with the human economy; but should any force, element or substance,—known or unknown at the present time—interfere with the source of production of these "minute bodies" or, interfere with the "minute bodies" themselves, decreasing or increasing them in amount or altering them in their functions; then as a result, apparently, there is much trouble in store for this unfortunate individual. This apparently holds true from either an acquired or heredity point of view.

Taking for granted that there are vast amounts of these "granules" in the make-up of the female element (ovum) and also in the male element (spermatozoa) when fertilization of the ovum by the spermatozoa takes place (the condition in the female, commonly known as, conception or pregnancy) it is quite evident that the two combining factors now make one cell, and according to the laws of reproduction, this one cell now divides and makes two (in accordance with the laws of cytology); the two again divide making four; the four again divide and making eight and so continuing until the new being is entirely formed from this law of cell proliferation or cell production; the new-born being the result of millions of cells which make up the different organs; these organs necessarily constituting the human being. Here then we have a united composition of male and female elements (in the new-born), and it is quite

possible, that according to the predominance of the one or of the other (of the parent's hormones or one of their endocrine glands), this will therefore be the power which will determine the sex of the embryo, at the same time giving to it (the new being to be) those strong or weak characteristics of the parents.

We have previously said, "the characteristics of the offspring may or may not resemble those of the parents." It is generally accepted as a foregone conclusion that any dominating or so-called "ruling" factors, are at any and all times, the important factors. As this postulate holds true in most everything and everywhere, also does it hold true in the terms of Arts and Science, as well as Political policies and Religions; in all countries of the world, civilized or uncivilized, therefore, directly and indirectly, these important factors control life and death in any specific type or group of the different peoples of the world. When we consider the question, "The Propagation of Man," there are primarily two dominating factors, an adult male and female. This is according to the law that the opposite or the positive and negative attract each other, and the same law holds true of the spermatozoa and ovum, these being the secondary factors; this being a situation over which the individual has no control, or, in other words, no man can command or demand at any time that the spermatozoa and ovum perform their function of reproduction at any given time, their own power of affinity and attraction are the dominating factors, which in turn produce, primarily amalgamation and secondarily conception. One author-

ity has declared that science is gradually learning new secrets concerning the relation existing between the hormones and human development and behavior. It is now well known that these secretions influence stature, build, proportions, details of the development of various organs and tissues, intelligence and emotional control. These hormones that determine individual personality, may constitute the bridge connecting this personality with the specific enzymes or hormones in the germ cells. Individuals differ it may be said, first by anatomical structure, second by the physiological function of that same anatomical structure, and third by virtue of differences of atomic structure and atomic activity of the enzymes or hormones making up that part of the stream of life-yeast which activates the protoplasm of each, and will in turn activate the protoplasm of their offspring. In other words, hereditary differences between people evidently are due to hereditary differences in the activity of the endocrine glands. Each person is what he is in physique, in his thoughts and his reactions largely by virtue of the peculiar properties of these activiting substances which are specific in him and other members of his family and race or biotype. The future of genetics, it is thought, lies largely in a study of these activities and the origin of differences in them.

Of late years there has been advanced "a theory of sex determination" which states "that the male and female element (the ovum and the spermatozoa) from which the child develops, strive with each other for mastery. Finally, the sex of the child displays which element gained the victory.

When the victory of the male element is decided and complete, the result is a Caesar, a Napoleon or a Bismarck;—active, determined and ruthless. When this victory of the male is less complete, the result is the ordinary, respectable, hard-working man, but possessing engaging weakness. Up to the present time, we find upon investigation, that life in its infinite beginning and primary stages, together with the fundamentals of reproduction—of the how, when and where it first came into being, so far as our world and life, as we know it to be, is concerned—is a mass of confusion and subject to much dispute, with much conjecture and speculation as to its initial origin. Now we come to the apparently most essential point, the proper formations of the internal viscera, especially the size and function of the endocrine or ductless glands. As a rule, we find these endocrines will be in harmony with the above mentioned factors (all internal viscera) from the fact that these were in early life responsible; but did thereby favor the individual in some instances or did grossly neglect the individual on other occasions. Connected herewith we have the following contention. If it is true that, in many instances, tuberculosis attacks the individual at or about the age of puberty and the sexual desire is abnormally increased at this age, in these types of cases then it is fair to ask, what is the relation between the susceptibility to infection of tuberculosis and the abnormal increase in sexual appetite at the age of puberty, and does the diseased condition bring about the increased or abnormal desire or does the change in the cycle of life "the age of puberty" bring

about the desire, with a consequent inclination to dissipation, resulting in a lowering of the vitality, with a loss of resistance, terminating in suceptibility to infection, galloping consumption, and early death. Going a little deeper into the question we may ask; what part is played in this regard by one or more of the endocrine glands? This is only one of the many diseases about which we may ask many questions relative to the respective relations between any and all disease processes and the endocrine glands. In other words, any effort in any way, which has not been attempted previously and which is proving to be the most acceptable innovation to those suffering from disease, surely will be received with a warm welcome and much appreciation; when these efforts are put forth by one skilled in his profession, accompanied by common sense and good judgment.

So it may be assumed that, when conception takes place, both elements, from the parents (the spermatozoa and ovum), do either possess primarily many millions of "minute bodies," or possess the power of attraction of many millions of these "minute bodies;" and secondarily these "minute bodies" are the foundation for the formation of the cell life (to come), which cell life will in turn, when formed (these cells being known as the embryonic cells), produce function, development and growth of the actual cell life (to be), thereby producing the different organs which make up the human being (when that human being, in the embryonic life, is properly nourished and supplied with the hormones from the several "true" endocrine glands of the mother, by way of the blood-

stream, from mother to child, the only possible means of supporting the new life), consequently the production of the human as a live being; life itself being a combination of function, development and growth.

The writer wishes to be fair with the reader and believing him or her to have ordinary intelligence and to have now acquired sufficient knowledge on the subject—after reading this work through—to draw his or her own conclusions in the answering of the following questions:

First, with a knowledge of the facts, to the effect and extent, that these "minute bodies" are present in certain glands (being produced by these glands) in the human being, and taking it for granted, that these glands and their power to produce these "minute bodies" were given to us by our forefathers (we will not discuss, at this point, how our very early ancestors came by these glands or at what period in the evolution of man, these "minute bodies" first made themselves known) we may ask, however, are these "minute bodies" truly responsible for all cell life, or, the beginning and ending of life, from the "apparent fact" that they originate in the ductless glands of the parents, apparently asserting their full prerogative in the following cycles of life? These "granules" are produced in the ductless glands,—excepting the gonads, in this instance, their function apparently not being to produce these "granules"—thrown into the blood stream and carried to the gonads whose function it is to produce the reproductive elements—the "spermatozoa" in the male and the "ovum" in the female—the gonads making use of

these "granules" for this purpose. Conception takes place as a result of amalgamation of these two "elements," they having a natural affinity for each other owing to their mutual composition and comparative source of origin, the attraction of the positive for the negative being the blending factor. After conception has once taken place these "granules" now play their important part in the blood stream of the pregnant mother, giving to the prospective infant the necessary quantitative and qualitative constituents,—the "granules" or "minute bodies" from the ductless glands of the mother (by way of the blood-stream) from mother to child—in this way, the primary cell life of the infant is formed, these cells later forming all organs and among them the organs or ductless glands which reproduce their kind the all-important "minute bodies" or "granules" and thereby continue the cycle of life.

Second, is it a mere coincidence that these "minute bodies" or "granules" manifest themselves in every and all instances of cell life—therefore, all life, vegetable and animal—contributing only to the temporary support of cell life and disappearing at the death of this same cell life?

Third, are these "granules" or "minute bodies" produced in the ductless glands—without reason—and thrown in the blood stream to be carried to the gonads and other organs—if they have no function to perform—in this group, with their ever apparent stimulation of these glands at the different periods of the life of the individual which make up the undeniable changes taking place (in

the human) in the cycle of life, from infancy to old age?

Fourth, is there no significance in the fact, that these "granules" or "minute bodies" are produced and given off into the body in such a way that they reach only the blood stream and the blood stream is the only source of support and nutrition, first, to the gonads of the male and female which produce the ovum and spermatozoa, and second, to the embryo, or, the child, in its primary conception and ultimate termination of, "the beginning of life," in the pregnant mother?

Fifth, consider the fact that many of our recognized authorities on the subject of "Endocrinology" contend that it is a deficiency of these "granules" or "minute bodies" or a gradual loss of function of all the glands, which produce these "granules" or "minute bodies" which bring on old age and untimately the "ending of life in the human."

WHERE (HUMAN) LIFE BEGINS IN THE HUMAN.
(As man understands it today)

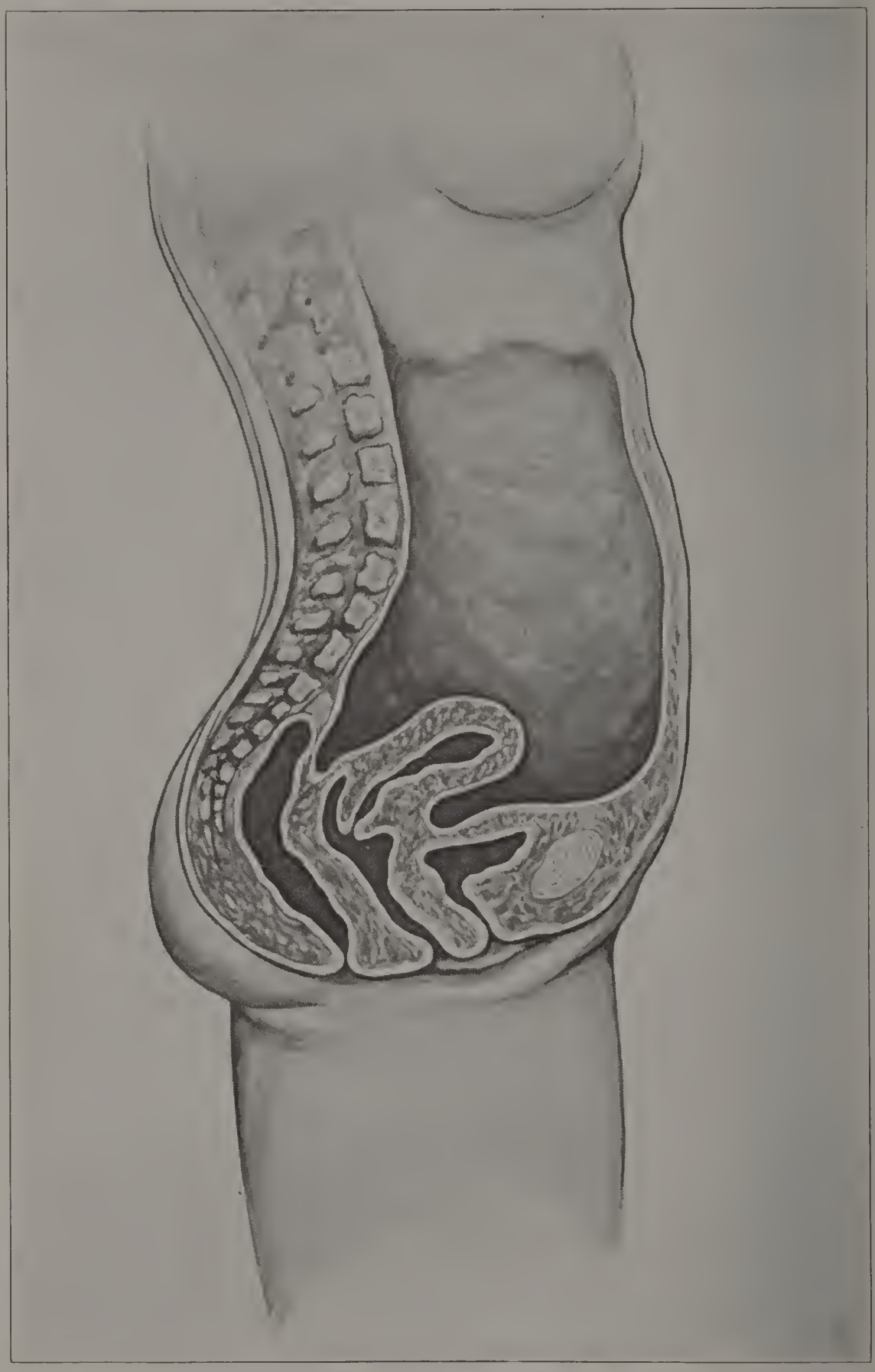


FIG. 9. Schematic drawing showing side view (sagittal section) of the nongravid uterus (nonpregnant womb) before conception takes place.

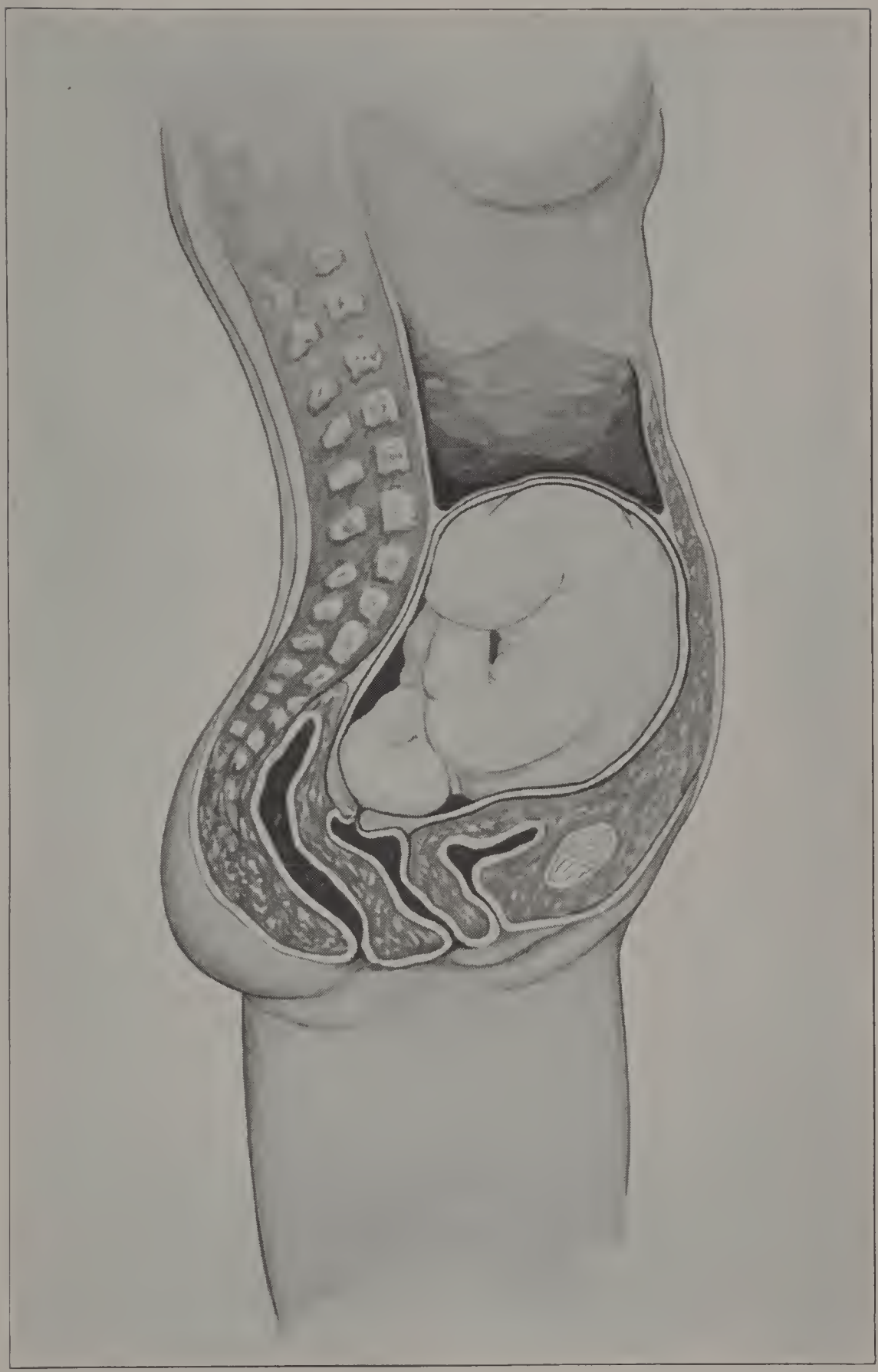


Fig. 10. Schematic drawing showing side view (sagittal section) of the gravid uterus (pregnant womb) about ten lunar months after conception has taken place. (Child about to be born.)

CHAPTER XX

CONCLUSIONS TO THE THEORY

"Labor omnia vincit"
(labor conquers all things)

BIOLOGY AND THE ENDOCRINE GLANDS:—

WHEN making our final deductions it would be well at times to hestitate, as we proceed, and pay homage to man's ingenuity; the mental and physical capacity which has, up to date, contributed to our material world and will no doubt continue to do so. It is the work of man (mental and physical), which makes all things possible. But what is the part played by the lower animal kingdom, when viewed from the standpoint of work,—the microörganisms and insects—and what is its significance in the life of man and its relation to his ingenuity?

Let us now presuppose (hypothetically of course, but that we may have a tangible basis to work upon) that our mother subject is "Endocrinology," or, should we say, it was—but we knew it not—the mother subject, many, many years ago. In this contention we have looked back into the depths of a dark past; there we see much evidence of innocent ignorance in the early days of the human being, a struggle for life's existence as a first essential to our present world of population, and as we return and come closer to the end of our journey of vision—the present day—the continual physical combat and never-ending mental conflict

from many angles, stand out as very prominent features of that long procession of the coming and going of humanity for ages, and termed, the advancement of civilization, or, the progress of man upon earth. In this contention—of our mother subject—we must necessarily also look far into the future; there we see, or rather the future generations will no doubt see, the many newborn subjects or off-spring of "our mother subject" which will and "must" eventually, come into existence as a result of those things which have gone before and those things—of a material and scientific interest to man, uncovered by him, yesterday and today in his quest of knowledge—in the plain evidence today; if we would continue our march of that same progress of civilization.

All modern science, its development in the various fields by man's earnest labor and that inculcated ingenuity, no doubt owes to a great extent, its early endeavors and subsequent growth to two entirely different groups of predominant ideas. The first of these two groups being those motives furnished by the necessities of life, with its continual struggle for existence; the second, that inborn inclination of an intensive desire of the human race to delve into the mysteries of all nature's processes and especially to fathom the profundity of the triplex enigma, consisting of, first, the origin of "Life;" second, the constitution of human "Affinity;" third, the sequence of "Death."

If we take for granted (for the time being) that these "granules" or "minute bodies"—the so-called hormones or enzymes, or ferments—(call

them what you will) are the products of a particular set of glands (the "endocrines" in the human), which have developed through a long and continual changing of certain specific organs; or through a series of changes in the process of evolution, in either case the cause or etiological factor being a combination of, first, the law of the survival of the fittest; second, change of environment or the acquisition of acclimation; third, nourishment provided;—all of which played a part (especially from the standpoint of immunity and susceptibility), as a necessary requisite, to produce these phenomenal organs, as possessed by the human of today—fourth, the causing of a more or less interrelationship between these organs by way of the blood-stream; it would then be a natural consequence, that this relationship (by its closed circle, the blood-stream), would in time become intimate and these organs each dependent on the other.

Bacteria and Disease Production:—

When we say in our theory "there must be a human being and also microörganisms to produce any disease," it stands to reason that, disease is the result of the coming together of two material things, human beings and microörganisms. If there were no human beings (which act as the host) for the microörganisms (which are strictly parasitic in nature) to live upon,—thereby continually reproducing their kind, with the evident consequence of worldly dissemenation in its far-reaching means of invasion and infection, resulting in destruction to the tissues of the human—it

again stands to reason these parasites without the aid of a host would, in time, automatically exterminate themselves. However, it is quite evident that the human race will remain, at least for a while, upon our earth and continue to be (in a great many instances) an easy and willing prey, in the form of a submissive housing host, extending in our ignorance a constant invitation of admission to this obnoxious brood and omnium-gatherum (miscellaneous collection) of pathogenetic animalculæ and microörganisms (giving origin to disease or producing disease) which are in our present day life, seemingly, omnipotent in their ubiquity. (The unlimited power of its kind, to produce disease in human beings, all over the world, at one and the same time.) This must necessarily be true, because there are many people dying every minute, in all parts of the world, due to infectious diseases.

If it is true that there are such conditions or diseases, known as, septicemia (blood-poisoning), tetanus (lock-jaw), peritonitis (infection of the peritoneal cavity or abdomen) and, if, it is true that certain types of bacteria—in accordance with science—are the actual cause of these and many other pathological conditions or diseases, the result of which being (in many instances) the cause of death of the human; then it follows that there must be an "unknown link" of affinity between these microörganisms and the human body, depending upon the immunity (or the resistance or a negative affinity between the human body or certain solid tissues or fluid tissues or juices contained within the human make-up, and these sev-

eral microörganisms) or upon susceptibility of the human body (or the lack of resistance or a positive affinity between any of the several constituents, above mentioned, in the human make-up and these microörganisms) all of which, would naturally be contained within the jurisdiction of this "unknown link" of "a positive or a negative" affinity; all being controlled by nature's "process of evolution," in its continuous cycle of life.

If it is true that all bacteria are made up of numerous "minute bodies" or "granules"—of different types and forms—and that the existence of such animalculæ as Schizomycetes (the microörganism group to which bacteria belong), Actinomycetes (the microörganism group to which the molds and mildew belong), Blastomycetes (the microörganism group to which belong the Saccharomycetes or yeast fungi, which constitute a "ferment" or various species), and several others depend upon these "minute bodies" or "granules," it is then obvious that these "minute bodies" or "granules," must possess a function; therefore, it is reasonable to assume that this function primarily is to reproduce its kind,—in a continuous cycle of "life giving properties" of the hereditary tendency and propensity but only from the physical and chemical standpoint (terminating in a systematic function of transverse division or sporulation) involving the secret amalgamating process of an unknown (to man of today) law, whereby the organic and inorganic properties of nature are utilizable—producing first a substance similar to a cell-membrane which acts as an outside wall for the bacteria, and, second, a substance similar to the

protoplasm or the body part of the cell, and third, when the bacteria have reached the limit of their growth, or are full grown and matured, these "minute bodies" or "granules"—or the bacteria as a whole—are responsible for the secondary function; a process of secretion or excretion, producing the many kinds of known products peculiar to each form of bacteria, to-wit: the primary destruction of human tissue as a necessary evil (to humanity) but very necessary to the life of bacteria in their unknown system or method of metabolism—the breaking down of human tissues and the building up, or reproduction of their kind—producing secondary in this process, pus, liquids, different coloring matter, and toxins (poisons) of various kinds and customary to their nature. In other words, these "minute bodies" or "granules" seem to be the generative factors in bacterial life and seem to be primarily responsible for bacterial existence. There are also reasons to believe that these "granules" give to the bacteria their energy to produce a substance peculiar to its kind and which we will term, for want of a better name, "granule extracts," but which are known to the scientific man as, endo-toxins and exo-toxins or intra-cellular-toxins and extra-cellular-toxins.

We may now venture to relate, upon a basis of surmising and speculation,—investing therein what general information we have on hand and that knowledge of facts we possess,—the whys and wherefores of the process of reproduction of bacterial life. From all appearances, these "granules" or "minute bodies" when they attain a certain age, seem to have the faculty of either, splitting in two

or throwing off a part of themselves,—of the original "granule" that was—in either case the original bacteria then becomes life size or full grown and the many "granules" contained therein become full grown, and reproduction of these "granules" takes place—by whatever method—the original bacteria, as a whole, now becomes too small a house to hold its increase in its immediate family (the procreation and creation, and the secondary development of the "minute bodies" or "granules" themselves), which apparently contains several generations,—a characteristic of bacteria being to "multiply with exceeding rapidity," in accordance with science—the many generations of "granules" must of necessity, now have a new home to accommodate its offspring, so the original house or bacteria now divides itself into two parts, —the so-called tranverse division or fission, in accordance with science—making two houses or homes or two individual bacteria, where a few moments before there was only one bacterium (singular for bacteria); it is now evident that when the young or newly created "granules" come into existence they go through the same process or pass through the same cycle as just stated above. As a consequence of this continual process there is a never ending cycle of reproduction which produces in its energy; first, new "granules" and second, a protoplasmic substance; and third, a cell membrane or outside wall substance which holds the house or home or bacteria (itself) together and in order; and fourth, the ultimate function now exerts and asserts itself. This last or ultimate function (the interference with normal physiologi-

cal function, in the human, and subsequent production of disease) is the one which manifests itself relative to all humanity and human nature. If it is true that a certain type of bacteria are detrimental to the human being—there being many forms which are not—by invading the body, then an infection takes place; and if the invaders are not destroyed at once, by the protective elements of that body, there is set up and into motion the continuous cycle of reproduction of "granules" and bacteria; to support this process of reproduction of bacterial life, there is a destruction of surrounding tissues and a proliferation or throwing off of toxins by the bacteria which is known as the cause of an inflammatory process; the toxins produced and thrown off by the bacteria penetrate the surrounding cells and tissues making them easy prey to the present and coming generations of bacteria,—in accordance with science—and as a result there are bacteria thrown into the bloodstream and carried to all parts of the body, therefore to all organs, many times causing much future trouble, if the individual survives the present infection. This continuous and necessarily progressive cycle of a parasitic nature, in its ultramicroscopic or apparently auto-procreation, after the primary infection once gains entrance to the human body, will in every instance continue indefinitely, at least (in the susceptible individual) while the environment in which it lives sustains the necessary requirements and maintains conditions to warrant the continuous life cycle of the bacteria, causing the infection. To stem the tide of progressive destruction of cell life and tissues

of the human body, and bring about the destruction of the offending bacteria, it is positively necessary to interfere, either by the human body having the auto-power to combat the infection in its beginning or there must be material aid given the body from the outside world.

VEGETATION AND THE VITAMINES:—

If it is true, that the purity of consistency, therefore the actual true life of such things as potatoes, carrots, celery, corn and many other foods, —which are said to contain, in large amounts, the new recognized and important element or ingredient (the so-called "Vitamines" which are necessary, to a marked degree, to the health and life of the human) in a comparative measured quantity or at least in sufficient amounts to prevent many of the diseases, or conditions (known as faulty metabolism) brought about or produced by the lack of these foods—depends upon "protection from the Sun's rays" so as to preserve these "vitamines" and make these things a fit food for humanity; then it follows that when these foods are exposed to the rays of the Sun, during neglected cultivation or from other reasons, they take up a substance (chlorophyll) which turns them green in color and makes them bitter to the taste and not fit food for the human to eat. It is quite possible that these so-called vitamines, as found in the several vegetables, are (in a way) in the same class (in the kingdom of vegetation) as are the so-called hormones in the animal kingdom; these "vitamines," or ultramicroscopic "minute bodies" or "granules," of the vegetable kingdom, being in complete harmony with the "hormones" of the hu-

man; when these vitamines under certain conditions and after passing through specific processes in their production, have acquired (we will say) their proper maturity; otherwise these vitamines, of the vegetable kingdom, are antagonistic to the hormones of the human.

Then it is reasonable to assume that the evident constitutional changes produced in these foods, result from the taking up of certain "minute bodies" or "granules," which are similar but incompatible with the so-called "hormones" or "enzymes" or "ferments" produced in the human. It may be, that the Sun's rays destroy the necessary so-called "vitamines" or it may be that the substance—call it what you will—taken up by these foods, when exposed to the Sun's rays possesses properties which are antagonistic and cannot be neutralized or destroyed by the "detoxicating elements" of the human; it being remembered that these "detoxicating elements" or "poison neutralizing properties," as found in the human are in all probability the "minute bodies" or hormones, produced and found in the "internal secretions" of the "Endocrine" glands, or their associates, the "foundation position" glands, and thrown into the blood stream of the human.

If it is true, that the chemical elements,—found in abundance in the foods of the human—such as the different forms of calciums, sodiums, potassiums, magnesiums, oxygen and hydrogen and many more, are essential requirements in the development and growth—tissue and bone building in the human—and in the maintenance of metabolism, therefore good health in every indi-

vidual (from infancy to old age), and if we are to believe that all of these elements play an important part in the so-called quantitative and qualitative mineralization process, also in the demineralization process in this same metabolism—thereby producing good health or bringing about different toxemias and aiding in producing other pathological conditions; then it is quite evident or at least not beyond a just presumption, that these elements are contained in the food and drink of the human and that they are composed of "minute bodies" or "granules" and that these are in accord, —or do harmonize—with those so-called hormones or enzymes or ferments found in the blood stream in the human, when we remember and consider the fact that the blood stream or the constituents contained in the blood stream—is the all important factor in aiding digestion and supplying nutrition to all the organs and tissues of the body, with a consequent producing of function; and, if mineral metabolism is intimately connected with disturbances of function of the glands of the internal secretions—the Endocrine glands—in the human; it being understood that the blood stream, primarily furnishes the life and nutrition to the glands of internal secretions of every individual after being born into the world so that they may perform their function and secondarily produce in the performance of this function the internal secretions wherein are contained the so-called "hormones" or "enzymes" or "ferments" or "minute bodies," said to be the essential fundamentals to life in the form of "stimulators," "detoxicators" and "regulators" which in its endless chain of

reciprocity—by way of the blood stream—gives to the individual all the qualifications necessary to produce the primary elements of life—the spermatozoa in the male and the ovum in the female—which later become amalgamated, when conception or pregnancy takes place; the blood stream of the mother then gives to this conception or pregnancy its primary essential factor—nourishment—that it may develop or grow in the form of a cell division process,—karyokinesis—this process continuing until the embryo has attained sufficient growth, in the intra-uterine life or becomes a full term child ready for delivery into the outer world; the products of the glands, the internal secretions,—of the Endocrine glands—as found in the mother of the child, playing an important part in the entire process of reproduction, by way of the blood stream; the child when born receives its necessary essentials of life, in the form of daily nourishment; this completes the many times mentioned, endless chain of "stimulation," "detoxication," "regulation" and "reproduction," by way of the blood stream, containing at all times the "minute bodies" or "granules."

So it may be seen, if for any reason there is an insufficient amount or an increased amount, of these mineral salts—which the human body apparently requires in a well regulated quantity and of a suitable quality—it will cause an irritability or act as an antagonizing cause of those glands and their internal secretions which have to do with the proper balancing of the equilibrium necessary to good health; then there will be as a natural consequence, an interfering or detrimental sub-

stance present in the blood stream resulting in a primary alteration or disturbance in the nutrition which supplies the organs and tissues and a secondary disturbance of function of these organs and tissues, bringing about abnormal processes or pathological conditions and, if, life is based upon the potential energy taken into the body in the form of food, then it follows that "affinity and antagonism" between these "ion" salts, vegetable "vitamines" and animal "hormones," must play an important part in the well-being of the human family.

Toxic Substances in All Nature:—

If it is true, that there are such material things as rattlesnakes, scorpions, tarantulas, centipedes and many more insects, reptiles, and animals—belonging to the different families—whose bite or sting is truly of a poisonous nature, tending to cause death of man when such noxious substances of a toxic mixture, in any manner, gain entrance into the blood stream of the human system; and, if it is true, that these living things do possess some where within their bodies these venomous materials, and if these same poisons are—in accordance with science—produced and contained within the bodies of these same baneful creatures; then it is jutisfiable to infer that this "venom" in every instance, is produced as a result of a "process of secretion" by a special type of cell activity contained within a special type of gland—within the body of these living things—these glands receiving their nutrition of life and support of function, to all appearances, from one source only, the

"blood stream" of the living thing itself; the life of the thing itself being supported, primarily, by food and drink, and secondarily by its environment, which in turn gives to the blood-stream the necessary properties to supply the nutrition for these special glands (as well as all other glands which produce other substances) that they may function and produce the different types of toxins (poisons) which are never again thrown back into the blood-stream, but are carried to a storehouse or reservoir contained somewhere within the body of the thing itself,—a common instance in all animal life, is to find several receptacles, within the body to store up the different secretions or excretions as the case requires—where they remain until required for use. So do we see that the blood stream is truly responsible for the production of the toxins.

It is necessary to give some consideration to the vast difference between man and these creatures of so malignant a nature; the difference is seen in the very nature of man's existence, his method and manner of living and mode of reproducing his kind; this in its entirety making that remarkable distinction whereby humanity is known as a group of warm-blooded animals, while these others (reptiles) are known as the cold-blooded animals. Much more could be said and should be explained but this small paragraph must suffice at this time, as it gives the several points needed and in which we are interested at this time; first, to make comparisons; second, to carry on ideas; and third, to make up our theory. It is necessary to select some "one" of these poison

producing and carrying creatures, so as to be as specific as possible and avoid confusion, in making a comparison. We will therefore take for our purpose the "scorpion," for the reason that its geographical distribution shows in many particulars a close interesting correspondence with that of the mammalia (a class of animals whose females have milk-secreting mammæ, glands or organs, to nourish their young, embracing man as well as other warm-blooded animals) and because of the scorpion's great antiquity; it being in the mediocre class as to size, in the insect or reptile family, with six legs which answer for its locomotive powers; the two extremes in this group are, the centipede which is sometimes termed the "hundred legged" insect, and the rattlesnake which has "no legs" at all, but both in the venomous group with the scorpion.

In the scorpion we find the exhibition of animated life; a systematic blood stream which supplies the essentials of life and also the glands which possess the hidden power to secrete or produce this poison; the accommodating structures to store this venom and the powers to use it when and where needed; the extreme or mighty power of this fluid wherein are contained the ingredients which cause death, produced in so small a gland, in so small a thing, as an insignificant insect. In the human we find the extreme as to size, intelligence, mode of living and process of propagation; the incompatability or loss of power to neutralize the toxins of these insects, and the antagonizing properties of this poison (even though it be only a few drops), in the blood stream

of the human; the severe clashing of these elements; those of the blood-stream of the human (many times causing death) and those of an insect; this venom producing group, being a waiting and fraught-with-death enemy of man.

The logical conclusions to be drawn here are, that man has glands within the body which secrete a protecting element or a detoxicating hormone, which is thrown into the blood-stream, that it may neutralize or destroy any foreign poisons with which it may come in contact,—by injury, or chemicals, bites, stings, bacteria, parasites and other methods of introducing any kind of poison into the body, hence into the blood-stream of the human—but it does not always succeed in its mission. The insect, on the other hand, also has glands which produce toxins, to be used for protective purposes, in the preservation of the life of the insect. In both instances the object is the same on the part of secreting glands; to give to the body, the protective elements that preserve life; even in microörganisms this function is present.

FINAL DEDUCTIONS:—

Having come to the final chapter of our work all the author aspires to add, is a sane explanation of the underlying principle together with its subsequent action of cause and effect, thereby bringing about the plausibility of this theory, being as it is, based upon the continual changes which have taken place upon our planet from time unknown; down through the thousands of so-called ages, our world has traveled in its somewhat seemingly

automatic adjustment and confluent conformation of materialization—which could not possibly have occurred except by way of what is actually a deceptive and illusive tranquility—with its apparently necessary (but truly false), quintessence and conciliatory confirmation of those things which happened in the progressive stages of evolution, causing to produce in its present termination, our "man's world" of today, with its every evidence of semi-perfection.

If it is true that all material things are in constant motion, there being a never-ending bombardment of molecules of one kind against another, these molecules being composed of atoms and the atoms made-up of ions,—in accordance with science—then it naturally follows that all things which the human perception would define as an existent tranquility and would consign to the field of peace and quiescency is in reality exactly the reverse of such human conception; our worldly sphere with its adjacent environment, being a state of perpetual action and a condition of more or less confluent chaotic readjustments (until such action and time arrive whereby an automatic formation of a systematic character would endure, brought about by affinities, and such conditions surely must have come about to produce all life, in accordance with science) expending at all times untold amounts of energy, together with an apparently hidden force of attack and motion,—conditions which would necessarily terminate in a subsequent change of all things (in time by action) thereby involving the consistent persistency of a state of evolution—from this source man has

learned his lesson of function. In other words, the natural tendency of all things in reality is "towards exertion," function, or work; from the ion to the atom and then to the molecule; from the molecule to all cell life, beginning with the microörganisms in bacterial and vegetative life, and terminating (at least apparently, according to our knowledge of the present era) with the minute cell life in the lower animals and man, which make-up the different organs that did ultimately constitute the human. Therefore, from their very ancient ancestors (the ions) have the cells in our human bodies inherited the instinct to exert themselves and function; finally this function culminating (in the cell) in the human as a natural and necessary element of stimulation; to perform and function; to production and reproduction by action; to progress by work. The presence of this actual fact is self-evident in the existence of all animation.

As a consequence of all that has been written in this work proper, an effort has been made to formulate a theory. As a sequence to this theory we have arrived at, and formed our conclusions. As a sequel to these conclusions there come the final deductions which may be stated in the following terms.

First, there has been much evidence (not mentioned in this work) accumulated by man, which tends to demonstrate, that this earth has been in existence for hundreds of millions of years. In its primary stage, no doubt, it existed as a barren world, devoid of all cell-life independent or organized. Inorganic matter was perhaps its sole

composition, but did not contain in its construction, those salts of the earth which are known to man of today. There was no affinity between the atoms of the elements which composed the earth's surface. The atmosphere was dry and hot, containing noxious gases of various kinds, now extinct and not known to man, carbon dioxide is a possible remnant. There was no water anywhere, and great mountains of sand (the only and most likely material or something akin to it, existing upon its surface) would pile up, first in one place and then in another, possibly governed only by the winds, volcanoes, earthquakes and its own motion. From time to time, this sandy material would shift, roll, slide and blow, making a mountain, in the course of time, first in one place and then in another, being carried from place to place by the force of the prevailing elements. No doubt the world at that time revolved upon its imaginary axis, but perhaps either in a more loitering fashion or in a much faster way, than it does today; it moved in its orbit, as a consequence in either case, there would be no regular change of seasons, such as we of today now experience every year. If the world made a complete revolution every few hours (of our time) as it turned and tumbled, racing along in its orbit, covering the distance of its circle in a few months (of our time) there would be as a result, no water anywhere, but just a hot barren waste, from the constant rays of the sun. Heat when applied to sand will form (what we call glass) a substance which contains little or no inorganic matter, it resembles granite and will not support organic life (all the known

chemical elements in our world of today being more or less combustible, singly or in combination).

Second, man of today generates electricity and uses it, but he does not know where it comes from or what it is composed of; there is much electricity in the air, no one generates it there, nothing obstructs its path, but the earth seems to absorb it, water is its greatest conductor and water is composed of hydrogen and oxygen, removes these two elements and man cannot live. The "ionic" theory or the "electrons," briefly stated, tells us; an "ion" is defined as a compound, as of atoms or molecules, with one or more electrons, produced by electrical decomposition or radioactivity; while an electron is defined as the smallest known component of matter, always possessing a negative electric charge. The opposite parts of an electrolyte (a chemical compound which can be decomposed by an electric current), which work their way through any liquid under the action of the electric forces, were named by Faraday the "ions," meaning, the travellers. At the end of the 19th century these ideas were extended, to elucidate also the conduction of electricity through gases. About the year 1897 it was discovered that, in certain cases, the moving particles which carried the electric current were of much smaller mass than the smallest chemical atom, that of hydrogen, and that these minute particles, to which were given the name of corpuscles, were identical with whatever substance from which they were obtained. They enter into the structure of all matter, and form a common constituent of all chemical

atoms. The only known properties of these corpuscles are their mass and their electric charge. Of late years several authorities claim, the recent discoveries of important facts give science good reasons to believe there exists a constant close association between the ions or the electrons and all organic matter, and these modern thinkers lay great stress upon the significance of this intimate relationship and its due recognition of consequence, in connection with these minute factors, and all cell life. Therefore, it may be seen that the late revolutionary or evolutionary view of nature, established in the biological and sociological sciences, is thus extended to physical science, not only in the development of planets and suns, but even in the chemical atoms (and therefore incidently, it may be said, all cell life), hitherto believed indestructible and eternal.

Third, insofar as the human and its reproduction is concerned. On the part of the (prospective) father, we find, first, the affinity or hidden power of desire, to seek the female (his wife) in secret seclusion of love and happiness; second, the production (on his part) of the male element, the spermatozoa, and his duty of placing this element in a location and position of advantage, where it may impregnate the ovum. Here we may hestitate long enough to remark that, in our selection of choice we have brought forth an important issue, and one having a strong tendency to lead into the paradoxical. Strange to say, we have here, an illustration of where one of our recognized postulates in figures, is proven to be false; for instance we say; one substracted from two and

the remainder is one; but in the case of nature's laws this does not hold true, because it requires one female and one male to produce a third individual, in this case, one taken from two leaves a remainder of three or viewed from another angle one (male element or cell of life) and one (female element or cell of life) will prodouce first, one cell, and second, one child; in conventional figures the sum of one and one, are two; it has been said when a man and woman become married, they then become one, but it is not very long before that one, which was, is replaced by three or becomes three, perhaps four or five. At the same time when we speak of an expectant mother we cannot altogether consider her as a purely single individual but as a kind of enigma of a trinity, not alone from the fact that there exists a great intimacy between the pregnant mother and her unborn child but the mother apparently, also possesses (incorporated within the unborn) much of the father's tissues (hereditary characteristics) the foundation for the phenomena being laid by the spermatozoa, when it entered the ovum and conception took place. Conception once having taken place there follows for a period of ten lunar months, the many possible physiological changes which may occur (to the mother) as a result of the growth and development of the unborn, and therefore much anxiety is felt relative to the mental and physical condition of the mother with child, who cannot always be considered as, an entirely normal individual in a truly normal condition. This condition no doubt is brought about by the action of the endocrine glands.

Fourth, if it is true these "enzymes," or "hormones," or "ferments," (or call them what you will, the term or name by which they are now known is of little or no consequence;)

> " 'Tis but thy name that is my enemy;
> Thou art thyself, though not a Montague.
> What's Montague? it is nor hand, nor foot,
> Nor arm, nor face, nor any other part
> Belonging to a man. O, be some other name!
> What's in a name? that which we call a rose
> By any other name would smell as sweet;
> So Romeo would, were he not Romeo call'd,
> Retain that dear perfection which he owes
> Without that title. Romeo, doff thy name,
> And for that name which is no part of thee
> Take all myself."
>
> —*Shakespeare.*

do exist as "live minute bodies" then we will have learned nature's secret;—the long sought key, the "open sesame" to nature's work—we will, apparently have been lead to the open door, so long closed to our intelligence, and for the first time in the history of the world, will we be permitted to "see the light" in the long night of darkness which existed in the past of life's relative obscurity, and center our future thoughts upon the solving of the "realm of mystery" the "beginning and ending of life," by looking in at the open door; further than this point we cannot possibly venture. The admission of our meager knowledge, relative to the entire subject matter, is indeed a just obstruction to our entering this door, and for the present we must be content to stand upon the threshold and gaze in awe, with reverence and much admiration,

upon nature's work; we may then look forward to a possible realization of a future knowledge, relative to these ingenious productive and reproductive powers, in its infinite creation of all animation.

> "Life is a narrow vale between the cold and barren peaks of two eternities. We strive in vain to look beyond the heights. We cry aloud, and the only answer is the echo of our wailing cry. From the voiceless lips of the unreplying dead there comes no word; but in the night of death hope sees a star and listening love can hear the rustle of a wing."

Thus, did R. G. Ingersoll, in a few words, define the mysteries of love, life and death, in the oration at the grave of his brother. Or this may have been intended as a definition of the departure from the body, of the so-called spirit, when the end comes. (When "death or life,"—which ever it may be,—takes flight.)

Ad finem
(at the end)

The world is beginning to see that people who can radiate sunshine and carry gladness and good cheer wherever they go, although they may be poor, are of infinitely greater value to society than the millionaire of money, who pauperizes everything he touches, and everybody who comes in contact with him, by his close contemptible methods.

Largeness of heart and generosity of soul make millionaires of character who are worth more to the world than mere moneyed millionaires.

The time will come in the progress of the world when we shall not have to depend on rich furnishings, costly tapestries, and gold plate. Character will become so enriched in the upward growth of the world that the surroundings, however costly, will be considered but a cheap setting of a precious life-stone. Cheerfulness is a potent factor of success.

—*Anon.*