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BIOMETRY

ITS RELATION TO THE

PRACTICE OF MEDICINE.

[A Paper read before the Section on Practical Medicine of the American Medical Association, at its Annual Session, held in Louisville, Ky., May, 1875, and referred to the Committee for Publication in the Transactions.]

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(*Published in* THE MEDICAL RECORD, *July* 17, 1875.)

IN the practice of Medicine and Surgery the arts of diagnosis and prognosis are of the greatest practical value. To excel in these arts, much study and great experience are usually required.

The initial step in the treatment of disease or injury is first the diagnosis, second the prognosis. Any art or knowledge that can aid in acquiring proficiency in this direction may be considered as an additional contribution to the science and art of Practical Medicine.

Without a sufficient preliminary knowledge, it would only be empiricism to undertake to treat scientifically any malady.

To be able to make an accurate diagnosis properly, the first and most important requisite is to study the individual characteristics of the person as well as the symptomatology of the disease.

Symptoms vary with the same disease in different individuals, hence a study of symptoms alone is only an imperfect method. Theoretical knowledge may be of value to the purely scientific student, but practical knowledge is absolutely necessary to the successful medical man. The recent graduate in medicine leaves his alma mater comparatively unlearned in the art of diagnosis; his first efforts are nearly guess-work. He no longer receives from his tutors hints and suggestions, and must perforce launch upon the sea of uncertainty and doubt, and perhaps with his very first case discover that he has made a great error.

If he has had practical bed-side experience, and been taught by a competent instructor, his first diagnosis may not be at fault, but if he has had no such practical advantage, then indeed it were fortunate for

the patient to be possessed in no small degree with great viability. But the study of symptomalogy alone can never perfect one in diagnosis and prognosis. There needs something more than present symptoms upon which to base a correct understanding of any case,—a knowledge of the physical indications of longevity must enter largely into these elements.

If symptomatology could illustrate for prognosis that degree of certainty which it does for diagnosis, the practice of medicine would be less empirical and more reliable.

From the earliest history of medicine there has always been recognized an indefinable something inherent in the human system, varying in degree and force—this has been variously designated the "tenacity of life," the "tolerance of disease," the "natural vigor of constitution," the "vis medicatrix naturæ,"—by which some individuals seem to be able to endure and pass successfully through the most serious of maladies or the most severe injuries without succumbing. Many instances might be enumerated in illustration, but every practitioner will readily recognize such examples in his own experience. How often persons have recovered after injuries, gunshot wounds and exhaustive diseases, who at the time, to all human foresight, seemed beyond recovery.

There is some inherent principle which mysteriously sustains life through these severe onslaughts. We must recognize a "vis preservatrix" and a "vis a tergo." What this force consists of neither Anatomy, Physiology, Pathology, Microscopy, nor Chemistry has been able to elucidate. We know that man inherits vital properties which are in force from conception to death; that his various components are endowed with lifetimes of variable duration; that, like other living things, some parts decay and perish before others, in regular succession. One day we see the plants beneath our feet spring up, throw out their green leaves and budding flowers, all endowed apparently with vigorous, blooming life; and in a few months, or perhaps days, their flowers, leaves, and stalks fade, wither, and die. These are but prototypes of man. He springs up, flourishes for a time in full vigor, and one by one his secerning organs fail, until at last his physical entity ceases. The vital property has ceased to carry on its secretive power in one organ after another, until it can no longer sustain life. It is not within human ken to describe this vital property.

God breathed into our bodies life, which proceeds under the various laws of our being, so long as they are not violated, until the human machine wears out. It is within our power to cut it short, but not to

prolong it beyond its natural inheritance. We can study its processes, observe the laws which govern it, judge of its force approximately, see its manifestations, and *estimate its probable period.* There are certain *uniform indications* by which we may judge of man's *probable lifetime.* Some men are *endowed* with short life, some with a probable long and healthy life.

Inherited tendencies, habits of living, occupations, observance of sanitary law and residence—all have their direct bearings upon the question of longevity. Acute diseases, accidents, etc., have their life-shortening influences. All of these must be studied in their various relations to length of life.

This study has now resolved itself into a special science, which has been happily designated by the name of

BIOMETRY.*

Its adaptation to the practice of medicine is only one of the many applications of which it is capable.

Its study is comparatively of but recent date. Like every other science its study involves labor and care; statistics are to be collected and compared, its rules and laws elucidated and fixed, to make its practical application of value. When these laws become understood, their application is readily recognized. In medicine, in life insurance, in business, in social life, in a higher elevation of mankind generally, both physically and morally, the application of the science of biometry will be found invaluable. The laws of natural selection, by which physical perfection may be attained, will find in its exposition the true guide-posts by which to accomplish that much desired result. Intuitively we all apply its principles, even without, perhaps, being able to analyze the reasons for our judgment. The physician, by observation and force of long habit, is constantly applying its fundamental truths. He sees nature asserting and exhibiting wonderful endurance and adaptation under the most adverse circumstances, yet he is unable to define or explain the reasons.

In every-day life we constantly apply its principles in our intuitive estimation of our fellows, we judge of men's qualities or adaptation for certain kinds of business, without system or explainable method.

To Dr. T. S. Lambert, more than any other man, belongs the credit of having studied and reduced to a scientific basis the development

* "This is a word whose precise derivation illustrates its intended meaning—from the Greek words, *Bios*, life; *Metron*, a measure." And as "Geometry, from *Ge*, the earth, and *Metron*, a measure, means not merely a measure of the earth, but also the science and art of measuring the earth, so does Biometry mean the science and art of measuring life or lifetime."

and application of this instructive and interesting science. During many years of close application and observation he has fortified its truth by thousands of examples, and so simplified its practical application to the business of Life Insurance, that its laws have become the fixed data in estimating the probabilities of life's period; and as this business, when scientifically and successfully transacted, very largely depends upon a correct estimate and judgment of the probable length of any proposed life, as a matter of security and equity, its application in this direction has already, in the company with which he is connected, reduced the hazard of the business to one of great certainty.*

He remarks in speaking of a lifetime:

"It includes inception, birth, and the intervening period until death. Life is never found in any other than these relations.

"It is seen under these different forms in the plant, in the animal, and in the egg. We should expect to see in each of these forms some substance in common, in which the life inheres; and if only one substance is common to all these, life must be dependent upon that.

"A plant is constituted of woody tissue, and of secretory tissue; the egg, of an amorphous substance and secretory tissue; the animal, of several tissues and of secretory tissue.

"The deduction is evident, secretory tissue is the only substance common to all living things.

"It has also a lifetime; it is born, it dies. No other substance is like it in these respects. In fact life exists only in connection with secretory tissue, and when one ceases to exist the other does also, and it is said that death occurs. While secretory tissue acts, life is exhibited; as soon as its action ceases, life is shown no longer; life must therefore be the property of secretory tissue, and its duration must be fundamentally dependent upon their constitution; or lifetime is merely the period during which the secretory tissue can act under ancestral influences, and when from any cause they lose that force, death occurs.

"Secretory tissue has, therefore, a birth, or a departure from ancestors, which is necessarily related to its decadence, on account of its gradual and irreparable exhaustion of ancestral influences.

"Secretory tissue is the only kind of tissue or substance that is transmitted from ancestors in either plants or animals, and therefore can,

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* The former method of basing the cost upon the general average death-rate of all mankind, as deduced from various experience tables, has, in that company at least, been discarded, and the results already accomplished by the application of this science to the problem has created the greatest astonishment in the life insurance world. Death ratios, from having been ten to twelve per thousand among selected lives, are reduced by this method with almost absolute certainty to less than four per thousand; hence the direct pecuniary benefit to the world, as respects life insurance, is more than three-fold as regards the proper cost to such risks.

and does, contain in itself all the inherited ancestral influences that are transmitted.

"Different natural lifetimes of different plants and animals must, therefore, be owing to natural or constitutional differences in their secretory tissues, and the necessary antecedent conditions for producing these differences must be found in the antecedent ancestors.

"There are not only different kinds of secretory tissue, having different lifetimes, in the same plant, but different portions of the *same* kind of secretory tissue in the *same* plant have different lifetimes. This is also certainly the case in animals.

"In man there are fourteen kinds of secretory tissue, secreting or producing, in their peculiar manner, from the blood, as many kinds of fluids. For example the tear fluid, saliva, gastric juice, the bile pancreatic, urinary, etc. In every kind of organ one or more kinds of the secretory tissue may be found. It may be also said that the six solids of the body are secreted, and the remark would in a sense be true. It may also be said that these, *i.e.*, the bony, gristly, sinewy, nervous, and muscular, as well as the secretory proper, do not only secrete, but exhibit life—for *secretion is living*, and cessation of the power or property of secretion is death. But in a different sense the secretory tissue performs this function of secretion, for it not only secretes itself, as the other five tissues do, but it also secretes some fluid for other uses than are found in itself alone,—the other tissues do not. In the new-laid egg neither of the other five tissues are found, but secretory tissue is there; ere long, the others appear. Each of these can be produced without the antecedent presence of any tissue of its own kind, but secretory tissue never, so far as we know, except in the presence of, and in contact with, secretory tissue.

"What hinders us, then, from finding all the organs endowed with peculiar lifetimes, dependent upon the lifetime of the secretory tissue or tissues essential to the structure of the organs respectively?

"It will also be found that all of the secretory tissue in any organ does not necessarily have the same lifetime. *Example.*—In the sides or walls of the stomach, we find, opening into that organ, millions of microscopic tubes, each one distinct from the rest, its interior constructed of secretory tissue necessarily endowed with its special lifetime, which may be shortened, but cannot be lengthened. It would be truly wonderful if the lifetime of all the tubes should be the same. Suppose 100,000 tubes to be endowed with a lifetime of forty years, and the rest able to live to seventy or upwards. Would the person pass the age of forty without inconvenience? The digestion would certainly be impaired, at

least for a time, and doubtless he would always after be incapable of digesting as much as previously. Although he might feel and appear to be as well, yet he could not accomplish as much of some kinds of work as if he had 100,000 more gastric tubes.

"In the stomachs of persons past the middle of life, exposed by post-mortem examinations, it will usually be found that already a larger or smaller number of the gastric tubes have been obliterated; the organ had, therefore, so much less capability of digestion. If we examine these tubes, we find that at the bottom of each the secretory tissue appears in the form of cells, or minute oval bags, which are filled with the gastric juice—that in fact is secreted in them. These cells grow with almost inconceivable rapidity when the gastric juice is needed in the stomach, and, loosened from their birthplace, they come up to the mouth of the tubes and, bursting, yield their contents to aid in the process of digestion. Successive cells pass up from the same origin in the bottom of the tubes. In this general form of cells of different shapes and properties, the active secretory tissue everywhere appears. Each cell has a very short lifetime, and each cell series has its own lifetime. The being born and dying of the cells is continuous, but in each succeeding cell there is a change and a progress, so small with each step, that it is not appreciable with our present means, but so sure and steady that in a certain period the process will necessarily conclude; life will then be no more manifested by that cell series,—its death will be said to occur, and its position will be barren.

"Organs, then, are not units in regard to the secretory tissues that enter into their construction. Each organ is an aggregation or a compound, and in the units, as they may be called, of the organs, there may be, and often is, a great diversity of natural lifetimes, apart from any effect produced by contingent influences. These produce what may properly be called *disease*, *i.e.*, that which cuts short, or tends to cut short, a natural lifetime. But when the death results from the extinction of the natural lifetime of an organ, or a part of it, at its full period, it will also be called disease, if the other organs have a longer natural lifetime and appear to be enduring. But if all of them have reached their natural period of death and manifest completed life, the person will be said to die of *old age*. But there is more frequently old age of an organ, or of part of one alone, than of all of them at once. If a sufficient portion of the secretory tissue of an essential organ be short-lived, a person will die at *its* death, no matter how long lived the other organs may be. But if the short-lived organ is not essential to general life, the use of it only is lost. A person may inherit from a father,

deafness (early death of the ear), or from the mother blindness (early death of the eye), yet live to a good old age; but if he has inherited lungs, kidneys, stomach, or liver short-lived throughout, he dies of the so-called disease—properly speaking, of old age—of organs to which his death is attributed.

"But they are the resultants of the co-ordinated vitalities and longevities of his organs, which, superficial or deep-seated, directly and indirectly, indicate their respective life capacities to the skilled or expert observer. Hence the difference in the vitality and longevity of men depends, primarily, upon their organic, or rather, tissural constitutions, and upon the relative importance of the shortest-lived organ or part of it in the organism.

"The inherited lifetime is always the resultant of the conjunction of antecedent ancestral influences, either of which, or both together, may deprave the inheritance below that of either parent stock. This is often the case, while very seldom do the concurrent influences produce a better condition than any antecedent. To the ancestry we must look for the capability of long-living. It is observable that a nose may resemble that of one parent and an ear that of another; the hair may be as red as a grandmother's on the mother's side, and the beard as dark as that of the grandfather on the father's side. The length of the nose may be like the mother's, the breadth like the father's—a single organ showing perhaps half a dozen inheritances, why not half a dozen lifetimes? Why not inherit a stomach from one, a liver from another, or a single such organ from a half-dozen ancestors? One brother, externally, almost entirely resembles the mother; a sister resembles the father so closely that many would say she does not resemble the mother at all. Why may it not be so within, as well as without? It is. It is a fact that a large majority of persons die nearly at the same age as some ancestor or perhaps younger, and of the same class of diseases. There is usually, also, a strong external resemblance. A great-grandfather died of heart disease, at 76, a grandfather at 71, a father at 65; the son strongly resembles the father and grandfather; the son rightly infers that "he will die still younger of the same disease;" but instead of calling his case a disease, he should say that his natural lifetime will doubtless be shorter than his father's.

"All parts of the body are originally constructed, and are each moment kept in repair, by the same dominating nervous centres. Those which make the stomach what it is, will produce some other effects which can be seen externally. Each organ exerts an influence, greater or less, directly or indirectly, upon all the other organs—upon those at the sur-

face as well as upon those within. 'Like causes produce like effects,' *within* the body as well as out of it. When, therefore, effects are seen upon the surface, the causes may be known to be also acting within.

"Can the internal inheritances, or the constitutional lifetimes of organs, be discerned by external marks, appearances, or indications? Certainly, in most cases.

"In the first place, by studying the necessary physiological relations of the organs of the body and the influences which they exert upon each other; and in the second place, by observing the external manifestations of the body with a discerning eye, the external indications of internal conditions and of the constitutional lifetimes of organs can soon be practically learned.

"*Example.*—It will be found that the kidneys, for good physiological reasons, have intimate relations with the skin, and that their conditions, liabilities, and probable lifetimes are discerned more readily, in fact through corresponding peculiarities of the skin, than they could be by looking directly into them, which cannot be done during life.

"Almost every one is familiar with various facial expressions or constitutional peculiarities that indicate present or future health of the various organs. To see more, only requires a closer observation, especially if guided by the light of a preparatory study of physiological relations."

The laws of Biometry are abundantly illustrated by heredity. The histological characteristics of persons when studied under these laws present the most convincing proofs of the status of Biometry as a true science. In the examination of the ancestral histories of thousands of individuals, the deductions therefrom establish the fact that certain measurements can be relied upon almost infallibly, by which to read backward from the person the life characteristics of the ancestry, and hence, inversely to determine the individual's life probabilities. So, when we find a person presenting these general measures in due proportion, we may judge, almost invariably, of his powers of resistance or natural viability. If so be he is descended from a healthy, long-lived stock of both parents, almost without exception it will be found as a rule that he is both healthy and long lived, able to endure much hardship, resist grave maladies, and to recover from the most serious injuries and great nervous shocks.

Again it is found from observation that where there has been long and vigorous ancestral stock upon one side, with perhaps short life engrafted from the other, such person will arrive at a period of partial decline, with ill health, and subsequently recover, living on and be-

yond this deflection, being sustained by the vitalizing secretory influences of the longer-lived ancestor. A moment's reflection will call to mind many such instances, as when persons have remarked that at a certain period of their lives they were suffering from some special disorder, from which after a time they have seemingly entirely recovered and enjoyed sound robust health. Many such instances must have occurred in every medical man's practice.

That longevity is a resultant of heredity no one will dispute, and that it does not depend upon race, climate, mode of life, or special observance of sanitary law, is also a self-evident fact. Those who have inherited it can, seemingly with impunity, almost defy all sanitary law, and yet continue to live up to and beyond the allotted limit of "threescore years and ten," while those who have not inherited long life cannot by any system of life, or observance of the laws of health or process of prolongation, protract their naturally short-lived inheritance. Of course we must admit that abuse can and does shorten the lives of the naturally long-lived, and acute disease or great injuries cut them off suddenly; but the rule holds good that the naturally long-lived inheritance affords that innate power of resistance which will carry them through disaster and disease such as will certainly destroy the naturally short-lived.

The probably short-lived may be equally healthy and robust, and able to endure almost as much, while that life lasts, as the longer-lived, yet it seems to be the fact and nature's law, that the period of existence has had its limit set beyond which no process of prolonging can avail to carry it beyond the allotted period. The secerning elements of the vital organs have their limits, and hence control the existence of the whole organism. We see this illustrated in almost every organ of the body; certain parts cease to perform their functions, die out; and, so long as these are not vital, life continues, although it may be in a restricted sense,—as, for instance, persons become bald or partially so at a certain age; they say the same occurred in their ancestors at about the same age; others find their digestive powers failing, and remark the same thing as having occurred in their parents or grandparents. The secretory vitality of these parts is then seen to follow the law of heredity.

Without an inheritance of long-lived secretory powers it is in vain to expect any great degree of longevity in the descendants.

In estimating the probability of a lifetime it is entirely useless to depend upon the general average of human life. This rule holds good only as respects human life at large, and therefore we must look beyond life statistics to sum up the problem. *With the duration of individual life general average holds no command.* Ancestral longevity will not

obey the general average law, but defies death in many shapes, holding on tenaciously until the machine, actually from rust and the interstitial deposits of years among its most delicate parts, wears them out. Even though many times wrecked, battered, shorn of all their sails, and rudderless, their sound-timbered, well-built organs ride out the storms of life to an extreme old age.

The important question then arises: Are there any well-marked indications, externally manifested, by which it is possible to judge of men's powers of resistance to the destructive influences of life?

Are these indications so palpable that ordinary persons can judge by the personal characteristics sufficient to estimate the probable chances of recovery, or in other words of the probabilities of life in disease, in different individuals?

These questions may be answered with confidence in the affirmative.

If such is the fact, then it must be admitted we have at hand one of the most certain means of deciding upon the prognosis, and the science of Biometry comes in as the grand marshal of symptomatology and diagnosis. Our treatment of disease can be regulated accordingly. It will not be necessary to fill the human stomach with the contents of the apothecary shop in order to find "something that may hit the disease." By reason of the certainty of our knowledge we can inspire our patient with the hope that is within us, and when he is so inspired half the battle is already won. Who has not seen the brightening eye, the stimulated courage, the grand fight of an unconquerable will, which hopefully and patiently has resisted the almost overpowering death struggle, when his doctor, judging from his own intuitive perception of the great tenacity of the life before him, has assured his suffering patient that he will recover?

Does it not occur to every practitioner, how many times in his own practice the thought has instinctively forced the conviction upon him that the patient would recover, and again with another patient his hope has sunk from seeing there, no sustaining vitality to aid in the desired recovery?

True, some medical men take no note of such conditions; they hope and fear for all equally and without special discernment.

But most physicians will recall scores of instances in which they have been favorably and unfavorably impressed by different patients, and mentally, at least, prognosed their cases accordingly.

Indeed, so decided and correct is this judgment with some physicians, that they and their acquaintances are prone to consider their off-hand conclusions at the bed-side as almost, if not quite, intuitions.

Let us pause for a moment and reflect upon these facts. Is it not a little singular that they have not more strongly and distinctly arrested our attention and so fastened themselves in our minds that we should draw from them the instruction which they are capable of yielding?

When we ask ourselves or others why these impressions, of decease of one patient and recovery in regard to another, how indefinite and unsatisfactory the answer? Ought we not to be able to give a reason for the faith that is within us? Are not our impressions wholly dependent upon the appearance of each patient respectively? Cannot these appearances be defined, be described in detail completely?

Cannot these appearances be analyzed, and the relation of each detail to disease or recovery be made so clear and conspicuous that even the tyro in medicine may have a reliable guide to a correct prognosis in every case? Shall we say, as is often said, that there is an indefinable something in the appearance of the patient that impresses us thus or so, we know not how or why?

Too long has this mysticism been allowed to govern the medical profession. Too long have we looked upon patients as through a glass darkly, and have envied the select few who seemed to have a mysterious, instinctive insight into the prognosis, as if gifted beyond their more plodding fellows, the mode of which was not to be described by them nor learned by observing their methods.

These erroneous notions must be laid aside, and we must see to it that prognosis is to be acquired in a scientific manner, not alone simply by feeling the pulse, looking at the tongue, taking the temperature, or other similar means, but by a thorough detailed analytical observation of all the signs and indications that patients present in the size and color of some or all parts of their bodies.

Another very important part of our prognosis will be dependent upon our having a correct idea upon the following point; that our organs are not units but communities, each member or element of which is nearly, if not quite, independent of its neighbor; for example, each gastric tube or gland in the stomach is, or may be, an independent unit, so far as its longevity and liability to disease is concerned.

Virchow has well said, that a single cell may be independently diseased.

Dr. Lucas in his Traité Physiologique et Philosophique de l'Hérédité Naturelle remarks as follows: "The *average of life* plainly depends on locality, hygiene, and civilization; but the *individual longevity* is entirely exempt from these conditions."

"Everything tends to show that long life is the result of an internal principle of vitality which privileged individuals receive at their birth. It is so deeply imprinted in their nature as to *make itself apparent in every part of their organization.*" *

The foregoing statement of Dr. Lucas is also quoted with emphatic approval in a recent work on Heredity, by Ribot, of whom Dr. Lambert remarks that he "may be justly regarded as the ablest of European writers upon this subject."

This interesting and practically important idea of the different lengths of life is well illustrated in the hair glands on different heads, not only, but on the same head. Some hair glands inherit a life of ninety years, while their fellows terminate their inherited longevity at twenty years or under.

As before remarked, how often we see baldness follow ancestry, even in quantity and position, and the question cannot be avoided: Does not analogy legitimately argue that a similar condition should be expected in every other organ of the body possessing a community of glands?

It is not enough that we analyze the appearance of patients, so that we can discern which *organs* are affected, but we should be able to recognize to what *extent* they are impaired, how large a *portion* of them has reached the natural terminus of the longevity belonging thereto, and which is bound to die then and there. If this portion is large enough, and belongs to a sufficiently vital organ, to commit homicide upon the other organs of the body depending for life upon the dying portions, it matters not how long-lived the other portions or the other organs may be by inheritance, they must then and there die from inanition. Marasmus is an apt illustration of a homicidal death by this method.

In such cases there will be at first a general appearance of much vigor, and a man of but little observation would be likely to prognosticate recovery, not remembering that "the chain is never stronger than its weakest link." We must observe the weak spots. Then shall we find that many more deaths are produced by natural unavoidable causes, namely the termination of the inherited naturally short life of some organ or portions of it indispensable to the continuance of the whole, than we usually have supposed; whilst again many recover from severe attacks on account of the inherent longevity of such a proportional part of the diseased organ that there really was no danger of dying even under the worst kind of treatment.

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* The italics are ours.

Will not these suggestions account for the apparent success of all kinds of quacks and ignorant pretenders everywhere and in all times?

Will not the consideration of these two fundamental ideas of Biometry—first, that each organ is not a unit but a community of parts in regard to longevity and liability to death; and second, that the inherent longevity of any considerable part of the body can be discerned through the signs and indications that its various external parts manifest—will not, I repeat, these points of Biometry make the prognosis of disease much more interesting and satisfactory and practical in its treatment than has ever been the case? Will it not be gratifying to exchange the unsatisfactory impressions, intuitions, or guess-work, as some are inclined to call it, for a rational, reliable method governed by fixed law?

All who have carefully watched the progress of disease must have been convinced that there is some general law to which these instinctive intuitions of many physicians point.

That fundamental law is found only in or rather constitutes the science of Biometry. Not only do all beings endowed with life tend, in obedience to the law of heredity, to repeat themselves in their descendants, but also in their physiological and pathological characteristics as related to health and disease, follow the same laws, or rather the broader one, of which the signs and indications of longevity are the expression.

But how may we discover the indications by which to judge in any given case of the probable lifetime naturally belonging to it?

By instituting comparisons or observing certain general configurations uniformly found in a very large number of individuals, it has been found that certain universal conditions pertain to the long-lived and to the short-lived exclusively. These are found in the size, shape, proportion, color, and capacity of all parts of the body.

Thus we can compare persons descended from long-lived with those from short-lived ancestors, and notice the differences which, as a practical fact, are *found to be well defined;* for example, the following: the comparative size and shape of the head; the colors of its external components, as hair, beard, eyebrows, eyes, shape and size of nose, lips, chin, and features in general, and their comparative relative measures; the trunk with its relative proportions,—it may be here remarked, that the length has even a more important significance than the circumference; for when the proportion of the trunk is in excess of one-third the height of the figure, we may be assured of corresponding great life, tenacity, and capacity. A comparatively long trunk gives us a form

that affords room for the functions of respiration and digestion, the two most important life-sustaining functions of the whole organism.

Given good respiratory capacity and good digestory apparatus, may we not prognose a healthy, vigorous constitution ?

In looking over these indicative points, especially in the sick man before us, we need also to inquire into his ancestral characteristics. What has been, not the average, but the special duration of the antecedent lives of his progenitors ? What were their peculiar diseases, family diseases so called, and of what diseases, and at what ages did they die, if dead ?

Here lies the clue to the factors of the disease under observation in any case.

By observing and applying the laws of Biometry in the treatment of disease, the medical man places himself in the front rank of the benefactors of mankind, and he is also thereby enabled the better to apply the great laws of hygiene for the benefit of his patrons. Observing the temperament, the tendencies to some special form of disease, the predispositions, he is qualified to extend his warning advice regarding Occupation, Residence, and Habits of life, and to suggest at what period of life may be expected certain ailments, and the necessary precautions to avoid, if possible, their worst effects.

Thus in applying the laws of Biometry we may not only be useful to our fellow-men in curing disease, but also as conservators by our forewarnings.

We arrive then at this grand conclusion, that when we come to study the laws of Biometry, we are no longer at a loss to understand the fundamental reasons of those apparent intuitions; they need only to be analyzed to give us the true indices of the viability and power of recuperative energy inherent in our patient. Mysticism is replaced by true science, which, when earnestly studied, gives us the grand truths of Biometry sustained at every point by Heredity, Physiology, Pathology, and actual results.

Having exceeded the allotted time which has been already extended beyond the limits usually accorded to papers, I will omit reading the details of the signs and indications which have been found to be so uniform in their general features as to be reliable indices of longevity (both long and short), and hence useful as indications having relation to the prognosis and diagnosis of disease.*

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* In another Edition the signs and indications of Biometry will be treated of in full. Please send for the complete edition, to MOREAU MORRIS, M.D., American Popular Life Insurance Co., 419 and 421 Broadway, New York City.

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It recognizes *professional knowledge* as *paramount* to the actuarial calculation of "general average" duration of life.

The *results* have been *fewer losses* per thousand policies than in any other company ever in existence. Its death ratios have been *less than four per thousand* for all grades, and less than *one per thousand* for the best grade—these so far outnumbering the inferior grades as to reduce the ratio of losses in all grades together, the reverse being true in all other companies.

By perfecting and applying the principles of Biometry to the study of life risks, the AMERICAN POPULAR secures beyond doubt the true probable expectation of life in each given case, and is thereby able to afford insurance at the lowest cost compatible with equity and safety.

Short-Lived risks are *charged higher in the same ratio* that *probably long-lived risks* are charged lower premiums, each risk being charged according to the grade to which it naturally belongs.

This **Principle of Biometrical or Physiological selection,** *dependent* essentially upon *professional* or *medical specialized expertness*, constitutes what is styled

"BED ROCK" or SCIENTIFIC INSURANCE.

The very nature of this principle demonstrates that the business of life insurance is primarily *dependent* for its *success and safety upon medical expertness therein.* Hence commends itself especially to the consideration and confidence of the medical profession.

Second.—**Best method of Insurance for any grade.**

The *methods* of insurance are secondary and wholly mathematical (actuarial). That recommended by this Company and which is the

best for all grades under ordinary circumstances, is **"Term Life" Insurance** (*natural premiums*). "Pay as you go." "Most assurance for the least money." This is styled

"HARD PAN" METHOD OF INSURANCE.

By combining **"Bed Rock" Principle** with **"Hard Pan" Method,** this Company offers to best grade risks

$10,000 Assurance for $60 Premium.

Third.—The transaction of the business between the Company and the public is its purely *commercial feature.*

These three distinct elements of the business plainly show that it can *only be conducted safely and equitably upon the basis of the application of correct, Scientific, Biometrical* and Physiological knowledge, such as *none other* than the *medical expert* can furnish, for only upon the proper selection of the risks primarily, can the Actuarial and Commercial elements be brought into successful execution.

Hence this Company asserts that this business *imperatively demands that the medical profession should insist upon its natural rights,* and that no Company can safely and successfully prosecute this business until it places its *medical department at its head,* or at least makes it equally responsible with all other of its Executive officers. The Emoluments as well as the Honors of this business should go to those whose responsibility and intelligence make it successful, and in corresponding proportion.

Hitherto the Actuarial and Commercial departments have almost wholly absorbed the honors and emoluments of the business, and failures have been the consequence.

This Company has placed the pyramid upon its base, and although it has been ridiculed as "a doctor's company," it can *proudly point to results,* and accepts the descriptive term as an honor to its directors and all who were concerned in its establishment, and are devoted to its successful prosecution.

Send for documents setting forth its death ratios and explaining its principles and methods, which cannot fail to be personally interesting to every medical man.

If by mail, send stamp to cover postage to the

AMERICAN POPULAR LIFE INSURANCE CO.,

419 & 421 Broadway,

Cor. Canal Street, ***NEW YORK CITY.***

Executive Board.

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