

HOW TO  
KEEP YOUNG

*by*

EDWIN WOOTON

# HOW TO KEEP YOUNG

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# HOW TO KEEP YOUNG

By  
EDWIN WOOTON

Author of "*The Metabolism of Senile Decay.*"  
"*The Conservation of Youth.*" "*General Law, and  
Individualism.*" "*Some Suggestions in Micro-Bio-  
metrics.*" "*Renal Excreta,*" etc.

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## INTRODUCTION

THE subject of life-prolongation has been in all ages one of widely felt interest. The literatures and oral folk-lore of most civilised peoples are rich in mythical legends dealing with miraculous wells, fountains of life, and cleansing fires. It is questionable whether bodily immortality, with persistence of environment, would add to human happiness. The question would be negatived by common instinct if the deathlessness connoted what we understand by senility. Desire for unending physical life has been allied to the assumption that it means unending youth.

Evidence of belief in such a possibility is not confined to period, race or region; but it was in mediæval Europe that such teaching held widest sway. Scientific research was almost exclusively devoted to three problems; the conversion of base metals into gold, perpetual motion, and the discovery or creation of a vital elixir—a fluid that should confer immortality of body. It is more easy than just to set down such seekers as fools, on the ground that they were pursuing the impossible. And we do know that although they did not attain their ends, they discovered many lesser truths. Modern chemistry is the child of alchemy.

## INTRODUCTION

### IS AN ELIXIR OF LIFE POSSIBLE?

The present-day leading biologists preserve an open mind on this question. Within the past few years they have seen many dreams materialise into commonplace fact. The airplane is one example; the submarine is another; while a third is the voice of the singer, and that of the orator being "tapped" for domestic use. From these, and a score of other facts men have learnt that the "impossibility" of to-day may become the commonplace of to-morrow.

From the scientist's point of view it is quite possible for any person—even the most illiterate, to light on some hitherto unknown fact. He, or she may solve some problem in biology, or aught else that has baffled the best trained, technically learned brains. But while a successful fluke is always within the region of the maybe, it does not come within the narrower horizon of things likely to happen.

Applying such truths to the present case, it may be said that whoever would find ways of prolonging life should first master the known facts of human physiology, and the known laws operative in death from old age; and that is just what the modern scientist does.

Within the past fifty years or so, there have been several quite independent discoveries that bear on this literally—"vital" question. The earliest of these dealt with the influence of the nervous system on organic life. It was proved that the body of man is in itself, so far as organic unity is concerned, a nervous-system, and that all other



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tissues derive their vitality from, and maintain it by means of this system. From this discovery sprang successful researches into the chemistry of the brain and nerves. From it sprang the teaching that in treating disease, whatever its character, one should nourish the nervous system. Of course, the teaching was "overdone." All new discoveries are exaggerated. Unreasonable expectations are based on them. Although what I may term the "nerve nutrition theory" has these usual faults it has saved thousands of lives, and has made life yet more worth being lived. It is now a recognised truth in medical science that to nourish the nervous system is to go a long way towards both preventing and curing disease.

The second discovery was that old age kills by narrowing, and in some cases blocking the smallest blood-vessels. It was found out that from birth to early adult life all the earthy salts taken in food are used up beneficially, chiefly in bone-making; but that from early adult life onwards, that is from the time of the completion of the bony skeleton, a great part of the saline material is not needed at all, and that a percentage becomes deposited in the walls of the blood-vessels.

The third discovery is due to Brown-Séguard alone. Putting the matter into a sentence, he found that the body is a chemical laboratory, having glands whose secretions govern the thousand and one activities of physical life, fight against the advent of disease, and are even curative of disease. It is true that the theory

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had been taught some centuries before the Christian era, but it had passed to the limbo of the negligible.

The fourth discovery was concerned with the importance of liver-size relatively to that of the body. For this, the author of the present booklet may, perhaps, be allowed some credit.

Quite obviously, the converse of the question : How can life be prolonged? is—Why does old age kill? And it is equally obvious to every thinker that these two questions cover the entire domain of human physiology, for they deal with the production of a healthy babe, his growth, maintenance and training ; his health and vigour as an adolescent and an adult ; and the forces that make for his bodily weakening and death.

The scope of this little work is very limited, but it is hoped that it will be of some assistance to all interested in the subject with which it deals.

## CHAPTER I

TRADITIONALLY, and by common experience the normal duration of human life, when not cut short by violence or disease, circulates round seven decades. Exceptionally, men and women live many years longer; the percentage of persons lessening as the years increase.

I have not set out to compile a table of statistics, and am willing to accept press reports as evidence that in our own day, and in Britain, several people have lived to enter their eleventh decade. But, whether the years be few or many, the end is *death*; it may be through violence, or one of the labelled diseases; otherwise, it is by Senile Decay, which is the name given to the condition of body common to old age.

The human body, when born, is a laboratory, and is capable of so dealing with food as to transform it into bodily tissues and fluids; able also, through special glands and other structures, to secrete various chemical compounds, which govern the growth and development of the body. Such special structures are termed "endocrinous." Among such may be mentioned the pituitary, and the pineal gland at the base of the brain; the thyroid, para-thyroid, and the thymus gland, in the region of the neck and the suprarenal glands, in the abdomen. All these are common to both sexes. The sexual glands,

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comprising the interstitial testicular in the male, and the ovaries in the female, are also endocrinous, but they do not function during the early years of childhood. In addition to such special glandular structures, there are tracts of membrane whose secretions are thought, by some, to have this character. Such are the lining membrane of the arterial system, and that of the brain ventricles, and the central canal of the spinal cord; a statement by no means exhaustive.

The supra-renal bodies secrete a substance, termed adrenalin, which has many functions, one of which is to contract the smallest arteries and capillaries. The pituitary gland is especially active during the period of growth. In a dwarf this gland is not sufficiently active. In a giant it is over active. The secretion of the pituitary gland has the effect of multiplying cellular reproduction. The endocrine secretions pertaining to sex have a wider influence. The means by which they work cannot be said to be settled; but it is beyond dispute that they help in the removal of "waste," and in the maintenance of tissue perfection.

All who read this are familiar with the external appearance of the human body in infancy, youth, middle life and advanced years. They know the many changes in vigour that occur between the beginning and the ending. These are as obvious as the indubitable fact that old age kills.

Equally true is it that changes in the character of the tissues and organic structures correspond to these alterations in vigour and size.

At birth, the skeleton, instead of being bony

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throughout, is composed largely of cartilage and membrane, the latter being found mainly in the so-called "flat" bones of the skull. A further peculiarity of infancy is the existence of a large gland already mentioned—the thymus; another peculiarity, is the greater size of the liver, proportional to that of the body.

The following table, quoted from an article I contributed to the *Dublin Journal of Medical Science* may be worth attention.

THE CHILD	THE ADULT
Weight at birth (say), 7lbs. (3,161 grammes).	Weight (say), 140 lbs. (63,220 grammes).
Weight of liver, 4.9 ounces (139½ grammes).	Liver weight, 60 ounces (1,700.97 grammes).
Daily urea, 3 grammes.	Daily urea, 33 grammes.
Ratio of urea per kilo of body weight, 1 gramme.	Ratio of urea per kilo of body weight, 52 grammes.
Ratio of liver weight to body weight, 1 to 22.8.	Ratio of liver weight to body weight, 1 to 37.3.
Ratio of daily urea to liver weight, 1 to 46½.	Ratio of daily urea to liver weight, 1 to 51.5.

### CHILD COMPARED WITH ADULT

Body weight, as 1 to 20.

Liver weight, as 1 to 12.2.

Urea weight, as 1 to 11.

The figures vary, so those quoted are approximately correct only; but always at birth the liver is—relatively to body size—much larger than in the adult.

Again, at birth the muscular tissue is of a character to effect only feeble contractions, and

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the organs of sex are without function. As the age of the child advances the thymus gland atrophies, the skeleton has nearly all its cartilage and membrane converted into bone, the muscles become perfected in their microscopic character, and sexual features mature. The period of fullest anatomical development is about the twenty-fifth year.

Structurally and functionally the body is *never* at a standstill. Bodily life is comparable to an arc; immediately the zenith is attained, the descent begins.

The atrophy of the thymus gland plays no part in the general decay. Its function is needed in early life only. Its retained activity would not be vitally advantageous.

If we examine the body at what is termed an "advanced" age, say eighty years, we shall find that the bones have thinned, so that they are more brittle; the coats of the arteries have largely lost their soft, elastic and resilient character, and have become infiltrated with mineral material; that in places these arteries have become softened; that the muscles have had substituted for their contractile tissue a large percentage of non-contractile material; and that throughout the bodily structures there are other degenerative changes. Thus, in the kidneys the secreting cells are partially replaced by those that do *not* secrete; in the heart muscle there is a substitution of non-contractile fibrous or fatty cells for the normal heart fibres; and in the lungs, and elsewhere, many of the smallest blood-vessels are partly or completely blocked.

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The chief distinguishing feature of old age is a substitution of lower for higher grade tissue elements. This accounts for all functions being performed less perfectly than in earlier life. To understand how the changes come about, and how they kill we must examine briefly some fundamentals of animal physiology.

During every moment of life two classes of work are being carried on ; the one is concerned with the using-up of body substance, and its removal from the system ; the other has to do with the reception and preparation of new material and its transformation into new tissue elements.

During the period of growth it is also necessary for the body to receive and elaborate material for the daily increase in mass.

Broadly, it is convenient to describe these two classes of work as "destruction" and "repair."

Now "destruction" is not a mere theory ; it connotes the actual using up of tissue, the formation of poisonous material, termed "waste," and the casting of this "waste" into the blood stream. It is taken by this means to certain organs, notably the liver and the spleen, and is there fitted for excretion, chiefly by the kidneys.

Speaking very broadly, the vital scheme of the body comprises a series of systems—digestive, vascular, secretory and excretory, whose parts and organs are controlled and energised by a fifth system, the nervous. This summary does not omit the lungs, which act directly both in waste destruction, and its excretion.

Attention has been drawn to the proportionate

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size of the liver in the child. This results in a complete power of dealing with all demands made upon it. Most people think of the liver as merely a bile maker ; but it has far more important functions. As the years go on, and the size of the liver relatively to that of the body lessens, the conditions are altered for the worse. When early middle life has been reached the destructor powers of this organ are *not* equal to the work demanded of them. This results in the retention of "waste" ; and this being in the blood stream is offered to the tissues as food. The trend of such poisoned blood is towards the gradual deterioration of tissue substance.

It has been mentioned that the skeleton of the babe is largely composed of cartilage and membrane, and that as the years pass these are converted into bone. During the early years of life all the lime and other mineral matter received into the blood is used in the bodily economy ; but as adult age is neared the demand lessens, and, as the supply continues, the ingested mineral matter works harm. Lime has a special affinity for the albuminous material of the soft tissues, and readily unites with cells that are too weak to resist its action. This is the change called "calcification," and, when it takes place in its favourite situation—the arterial coats—the vessels lose much of their elasticity and resiliency. Another favourite situation for such change is the capillaries ; and vessels so attacked become either narrowed or blocked.

So far I have dealt with bodily structures and bodily functions without more than a passing



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reference to governing powers. I have dealt with an engine in motion, which repairs its damaged material, and removes its waste. But I have not shown the means by which all the many associated parts and organs are maintained as a unit, or individual. This is effected by the nervous system, embracing the brain, spinal cord, ganglia and nerves. The nervous system is the agent through which the myriad cells of the body are united into a *being*. It is the means by which all muscles are governed, all sensations are experienced, and all organs are controlled. But this system is dependent for its power on two things—its own structural integrity, and the responsiveness of the tissues.

If this perfect functioning of liver, endocrine organs and nervous system continued without impairment, the passing of the years would not bring about any injury. It is because they do *not* retain their perfection that time works harm. The body is slowly poisoned, and all the changes felt and seen that we associate with old age result, at least primarily, from poisons, some of which the body itself has made, and others that it has received in its food, and of which in neither case has it been able to get rid.

When waste matters, chemically styled "purins," are offered to living cells as food, the latter are injured, and finally undergo destruction, their places being taken by cells of a lower type. As *all* organs of the body are so affected, including those with endocrine functions, a vicious circle is established, and the mischief increases day by day until the so-called "inevitable" end.

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Long before the enfeeblement of old age arrives we see the face become wrinkled, sagging, puffed and otherwise marred. The man or woman of middle life has lost the facial appearance of youthfulness. Why is this so general?

It is not because the degenerative changes we have followed are more active in the face than elsewhere. It is rather because the face has a peculiar anatomical structure, and is exposed to peculiar influences. If the chest or abdomen of a well-nourished person of seventy be examined it will be found almost or quite free from those impairments which are so obvious in the face. These covered parts are made up of widely spread, smooth muscles. The muscles of the face are numerous and small. In the face a thousand and one muscular contractions go to the expression of the emotions. On the chest and abdomen the movements are wide in extent and few. The skin of the face is washed far more frequently than that of the general body surface. It is exposed to all the varied states of the atmosphere. And lastly, it is very certain that the face is influenced by the mind more immediately than any other bodily part. In addition to all this its tissues of course, take their share in the general bio-chemical impairment. Not a word of this is merely speculative theory; *all* of it is cold fact; and the bearing of it on any attempted treatment must be obvious to every reader.

## CHAPTER II

THE body may be poisoned from without, either through the diet or the air breathed. The danger from wrong diet is far more prominent than that from wrong air. Most food stuffs contain purins. They are as truly "waste" as the purins of the human system. They undergo absorption, add to the work of organs that have to deal with such poisons, and—when not destroyed—work grave mischief. The worst foods in this regard are the lean of pork, beef and mutton, chicken, plaice, halibut and sweetbread. The mildest offenders are eggs, milk, cheese, butter, sugar, white bread, lettuce, rice, tapioca, cabbage, cauliflower, macaroni, strawberries, wines and spirits. Between these two we have a lengthy list; the most noticeable members being cod, sole, spinach, figs, dates, onions, potatoes, oatmeal, turnips, peas, beans, carrots, parsnips, sea-kale, rhubarb and asparagus.

An infant has at birth a larger demand than at any later period of his life for proteins, sugar and mineral salts. Over-feeding does not work the mischief it does in the adult. When more food is taken than can be used, it is vomited, or is cast out by the bowels. The child uses, relatively to his size, far more calories than does an adult; also he loses heat more quickly. For each kilogramme (2½ lbs.) of weight in the infant the heat-production is about one hundred

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calories ; whereas for the adult it is about thirty. The usual increase in the infant's weight corresponds to the retention of from twelve to twenty per cent. of the calorie potential of the total metabolism. The retention of the protein ingested may be estimated as from twenty-five to forty per cent.

Growth depends on the food supplied being in excess of the quantity needed for heat-production, and the replacement of destroyed tissue.

Here, with humble apologies to my scientific readers, I may explain for the benefit of others that the word "calorie" means a standard unit of heat measurement. That unit is the heat required to raise one pound of water four degrees Fahrenheit. When applied to foods, the calorie value is the heat value of fifteen and a half grains, that is—one gramme. Tables of calorie values are helpful in comparing the heat-producing powers of various articles of diet. All foods produce heat, whether they undergo normal digestion, or abnormal fermentation. But all foods do not produce heat equally. Starches, sugars and fats give rise to more heat than an equal quantity of proteins. The value of heat in the economy depends largely on age and climate.

In the later years of boyhood the figures are striking. The boy needs a metabolism of about forty calories per kilogramme of weight daily. If he is very actively engaged in school sports, the demand may rise to more than double this. His diet has to satisfy basal wear and tear, the special demands made by destruction of tissue

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through exercise, and by loss of heat in his games, and whatever may be needed for his growth. *The food quantity required by a boy of twelve is frequently fully equal to that demanded by an adult land-worker.*

The very large number of chemical compounds that make up the human body can be divided into these groups; proteins, and things made from protein; fats, and things made from fat; animal sugars; water; salts.

I wish to dispel some of the fog that has arisen through the loose application of the term—"protein." Strictly speaking, it applies only to a class of compounds that have a closely related character. They are found, not only in our own bodies, but in many food-stuffs, as lean meat, eggs, and wheaten flour; but always they are found in association with things that are *not* proteins, as starch, fat and water.

Between pure protein and a protein-bearing food there is as great a difference as between pure gold and gold alloy. Often, writers on matters dietetic are in opposition because they are using the word in different senses. Often, too, a writer will at one moment employ it in the purely chemical and accurate meaning, and at another in that which is broader and inaccurate.

The first fact to impress itself on the student of biological chemistry is that protein is *never* derived from anything save a member of its own class.

Whether it comes from milk, the lean of meat, eggs, grain or aught else is a matter almost negligible, for the parts and organs of the body

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have the power of elaborating it into the special character that each may require. But not all the starch, sugar, mineral salts, oil, water and alcohol that can be given will furnish material for one grain of protein.

Fat has a wider origin ; it can develop from the fat of food, and this is its most direct source. It can be made from protein, and from sugar. It can also be made from starch, but only by this being first converted into sugar. The production of fat from its own class of substance is of great practical importance in very cold climates, with scarcity of grain foods. Sugars and starches are chiefly used in warm and temperate climates, and they are very suited to these, as the fat they give rise to is more or less delayed in formation, and may indeed not be made at all ; the sugar and starch being otherwise used up in the body.

Protein is not only the least economical source of fat, it is one positively injurious, because fat has *no use for nitrogen*, and protein contains it largely. This nitrogen is discharged into the system, and is apt to occasion excess of uric acid—which is one of the worst poisons affecting adult humanity. Always, protein food should be cut down to the lowest limit of natural demand. It is impossible to emphasize this fact too strongly. Protein, when taken in excess, *is never stored up as protein*. Only when the body is growing, or more protein flesh is being formed from some other cause—as great muscular exercise—can it be at all freely used.

It must be kept in view that the purpose of fat formation is not merely to fill out hollows, and

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serve as a wrapping ; it is also a material which, when acted on by oxygen, will keep up body heat. Sugars will, in a similar way, serve the needs of temperature. Starch is equally useful ; and starchy foods have this advantage over fat as articles of food ; they do not give rise to the biliousness that fat would, if taken as freely ; they also have an advantage over sugar in that they do not sicken the palate.

Water is one of the compounds that can be formed from others in the body. It is also contained to a greater or lesser extent in nearly all solid foods ; but, these facts notwithstanding, it is convenient to give water as a liquid ; the reasons are too obvious for discussion.

### CLASSIFICATION OF DIETS

A "mixed" diet is made up of animal foods, including flesh, grain foods and vegetables.

A "fleshless" diet excludes flesh, but includes all other constituents of a mixed diet.

A "vegetarian" diet excludes all animal products.

A "fruitarian" diet is entirely or chiefly made up of non-starchy foods.

### THE USES OF FOODS

To satisfy appetite ; to repair destruction of tissues ; to afford a medium for maintaining body heat ; to be the medium, or "fuel" for muscular work ; to afford material from which all the numerous glandular secretions can be made. All these purposes can be effected by *any* one of

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the diets ; but that is not saying that they can be equally well effected.

### PROPERTIES CONSTITUTING EXCELLENCE IN A DIET

These are : Ease of digestion ; low percentage of things that cannot be digested ; absence of properties tending to cause diarrhœa, constipation or irritation of the digestive organs ; slightness of tendency to produce excess of uric acid.

In these regards all diets are *not* equal.

A perfect diet, suited to the needs of all persons, is an impossible formula. Digestive powers, although identical *in kind* in all persons, differ with personality in degree. The striking contrasts in tendency to constipation, diarrhœa, and other peculiarities also render diet uniformity an outrage on good sense. Already it is more uniform than it should be ; and the varying ways in which it is dealt with by individual bodies is largely responsible for much of human disease and ill-health. The best dieted man is he who, having learnt from his quickly cumulative experience, discards whatever gives him pain or discomfort ; or who, finding that certain articles negative the unpleasing tendencies of others, adopts them.

We must always keep in mind that the physical state of a food may help, or hinder digestion. Thus, an intimate mixture of fats, proteins and starch is very bad for the proteins. We see this in pastry. Proteins are largely digested in the stomach ; starches only very slightly ; and fats are not digested in the stomach at all. There-



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fore, the stomach can deal with bread far better than with a farinaceous food literally soaked through with fat. Here the gastric juice cannot get at the protein.

Another kind of physical need is that the food shall be friable. If it is a solid it should separate in the stomach into small particles. Stale bread does this ; new bread does not break up readily, but forms a pasty mass. Cheese also has a tendency to form a paste. For this reason it should be well mixed with stale bread, or biscuit in the eating. Then we must keep in mind that although foods may be quite right in themselves, their admixture may present difficulties to the digestive organs, occasioning slowness in their work, which will in turn allow various bacteria to set up fermentation. Rich gravies, and many other things act like this, doubtless by soaking other foods, and hindering the action of the digestive juices upon them.

### FOODS DIFFICULT OF DIGESTION

In seeking foods easy of digestion it is necessary that we study our own powers. If they are weak, such articles as pork, veal and cucumber must be shunned ; but if we find ourselves able to deal with these, and with other food-stuffs that tax the digestive organs, there is no good reason for avoiding their use.

Always, however, food must be free from irritating properties, or these must be counteracted. Much acid fruit is likely to occasion gastric or intestinal trouble. Capsicums, and

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strong alcohol may offend in the same way. Free indulgence in stewed rhubarb may prove too laxative to the bowels ; and, on the other hand, eggs and milk have a tendency to constipate. Beef-tea, steak-pie, and all meat stews are laxative, sometimes indeed giving rise to acute diarrhoea. Two facts should be noted with regard to all such properties ; it is sometimes possible to negative them by using at the same time, or at some other period of the day foods with an opposite tendency ; and these properties acting in certain persons may be regarded as medicinal.

The acidity of fruit may be considerably modified by using grain food, or bread with it. When any article occasions diarrhoea, milk or hard boiled eggs taken later on will usually counteract this. Again, although alcohol and capsicums irritate the stomach, their employment on occasion may be beneficial, by compelling a flow of gastric secretion.

The problem is how to adjust the use of these things in manner to avert ill-consequences.

Anyone buying a gold ring would wish to know its "carat" ; in other words, how much of it was gold, and how much was alloy. Now, the "gold" of a food is only that percentage of it which can be made into the flesh of the body, or be otherwise utilised. All foods are not alike in this respect. Cheese has not one indigestible grain in a pound ; but peas and beans contain in each pound weight a percentage of absolutely useless material.

A food that may look all right in a printed analysis, may be all wrong when put to this test.

## CHAPTER III

MANY of the published tables that profess to show how one can live on next to nothing a day are sheer nonsense, for they are based on chemical analysis only, and ignore the great truth that a food is not of the slightest nutritional use in the body unless it is receivable into the blood. One may easily demonstrate on paper the caloric value of a dietetic article, but unless it can be absorbed it is as rational to urge people to eat coke. The bodily laboratory can deal with neither.

One of the greatest frauds is beef-tea. Cooks frequently speak of getting the "goodness" out of the meat. They do that, but the goodness is changed into "badness." When meat is boiled, or is treated by any kind of moist heat, the extracted nutrient constituents of the meat are changed into compounds that are almost useless in nutrition. Neither beef-tea nor broths of any kind are nourishing, but they are stimulating. This is so true that they may be given in place of alcohol. Their drawback is that they have a tendency to occasion diarrhœa.

Undoubtedly, one can live on less food than is usually consumed. A few years since physiologists judged a man's needs by the output of the skin, kidneys, and other excretory organs ;

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which is as rational as judging the heating needs of a room from the quantity of ash in the grate.

However good the digestion may be, a large percentage of a full diet is wasted ; It never gets absorbed into the system. If it were not so the big eater would soon become a freak fat man. But this excess of food does harm by soaking-up, and so removing the digestive juices.

The diet of common-sense, and good science comprises such flesh-formers as fish, meat, cheese, eggs, milk, bread, and potatoes. It includes fruits, and green vegetables—these last for their medicinal action chiefly. It prefers uncooked to cooked green-stuff, and baked or steamed potatoes to boiled. The diet expert looks askance at pastry, unless the digestion is strong. He does not allow tea with fresh meat. He abominates stinking game, because, although cooking may have killed the bacteria, it has not removed the chemical toxins they have formed. He insists on food being eaten leisurely. He does not allow undiluted spirits; but he recognises that diluted alcohol is often of service. The expert teaches that because a native of some special country is well nourished, and keeps in good health on the diet of his country, it does not follow that a native of some other part of the world will do equally well on it. He teaches that there is such a thing as inherited ability to deal with a diet. This is seen even with oatmeal. A Scot will do half a day's work on a breakfast of porridge. But a Londoner, used to his rasher and egg, will want to throw

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down his tools two hours after a porridge breakfast.

### VITAMINS

Many years ago it was found that although two or more foods would appear equal in nutritional constituents when analysed, they would not be equal nutritionally, when used. It was sometimes found that of a number of foods the poorest on analysis had nutritional properties not possessed by the others.

Biologists assumed that such properties were due to the presence of compounds to which they gave the name, "Vitamins." These they divided into classes, assigning them the distinguishing letters, A, B, C, and D. As yet, these compounds have not been obtained in the pure state, but their existence is accepted as proved.

The following table may be of interest. It shows the main sources of the A, B, and C vitamins. Vitamin D is not included. It is of rarer occurrence than any of the others. Butter, and cod-liver oil are known to contain it.

*Vitamin A.*—Affords resistance to disease. Found in cod-liver oil, roe of fish, butter, egg-yolk, mutton and beef fat, milk, fatty fish, greens, carrots, tomatoes, margarine of animal origin, wholemeal flour.

*Vitamin B.*—Is a nerve tonic. Found in yeast, milk, internal organs—as hearts, livers, etc., egg-yolk, nuts, peas, beans, lentils, and all the whole-grain cereals.

*Vitamin C.*—Especially anti-scurvy. Yielded

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by oranges, lemons, grape-fruit, tangerines, peaches, blackberries, raspberries, tomatoes, raw greens, raw swedes, raw carrots.

This list is not by any means exhaustive.

Vitamin A is, in daily life, derived mainly from milk, butter, eggs, and animal fats.

With regard to Vitamin B, it is essential that the food containing it be readily digestible by the user. Milk and egg-yolk are the most widely useful foods in this respect. Nuts are sometimes useless because they cannot be digested. Special preparations of yeast may be of service, but the yeast should have been killed by heat. To take living yeast is to have fermentation carried on in the intestinal tract, with a great deal of accompanying discomfort.

## THE GREAT BREAD CONTROVERSY

Weight for weight, wholemeal bread is more nutritious than white bread, and, if the diet were so restricted in character that bread had leading importance, it would be acting unwisely to prefer white to the wholemeal variety. But the case is otherwise in England. That which white bread lacks is made up for by that which many other articles of diet supply, and in a more readily digestible form than does wholemeal.

Arguments based on experiments made on rats are not convincing, for the excellent reason that in such experiments the animals have been confined to a bread diet.

It is said that since the use of highly refined

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white flour became so general certain complaints, especially those of the heart, the joints, and the appendix, have increased widely, and an attempt has been made to connect the facts.

Some authorities deny that white bread contains any Vitamin B.

White bread is, weight for weight, richer than its rival in calories. On the other hand, a considerable percentage of the wholemeal consists of cellulose, which is indigestible.

It has already been pointed out that when cakes and pastry occasion dyspepsia the cause is not in the indigestibility of the materials that enter into their composition, but in the fact that these are mixed so intimately that each cannot be got at by the special digestive medium which alone can deal with it.

In this connection it must always be borne in mind that indigestion allows fermentative changes to be set up; and that chemical substances are thereby produced whose absorption is highly injurious.

Simplicity should characterise the diet. People forget that ginger, cloves, cinnamon, and other spices are rich in principles that affect the nervous system, and the intestines. They eat cayenne pepper without realising that its free use may occasion a tender state of the stomach interior. Or they indulge very freely in common pepper, and then wonder why their kidneys are so active.

More real harm is done by following heretical dietetic fads than by blundering along the road ordinary humanity follows. "Fletcherism," the

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system that tells us to reject and eject the solid part of that which we masticate is an example of harmful inutility. The inordinate consumption of oranges and lemons has ruined many stomachs, and has seldom cured a sick one. Common-sense in refusing to be misled by any such procedures is as clearly in the right as when declining to take undiluted brandy into an empty stomach.

The question of meat-eating, as opposed to vegetarianism - involves many considerations. Unquestionably, taking weight for weight, meat yields more nutriment than does any article of purely vegetarian diet. It does not yield so much as cheese—when the cheese can be digested. Obviously a diet into which a weight of cheese entered equivalent to the weight of meat commonly taken in the day would upset most people.

The chief objection to meat is the fact of it being heavily charged with the same class of poisons that are produced by the human body.

Meat is "choked" with these purins. More especially is this the case when the animals have been driven many miles on foot before being killed.

It is quite true that all fruits and vegetables contain purins, but they are found only in the indigestible cellulose, and so only a very negligible percentage is swallowed, while that obtaining access to the blood is yet smaller.

Boiled vegetables are scantily nutritious, and are not beneficial in any other way to an appreciable extent. The potato is the most



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innocent in this regard ; but, to get all its value one should bake it in the skin.

Of course it is not always practicable to eat fruits and vegetables in the raw state, but the advantage of doing so cannot be questioned. The living growth yields to the eater something that cannot be weighed.

From what has been said it will be plain that in formulating any dietetic system no rules can be laid down that can be universally applicable.

Subject to such restriction, it may be advised to use wholemeal bread, reduce fat-consumption in hot weather to the lowest point compatible with convenience, forego salted meats, take meat of any kind only so far as the palate may demand it, vary this with white fish, use baked in place of boiled potatoes, avoid loading the stomach with boiled turnips, marrows, carrots and cabbage, eat very freely of greenstuff, and raw ripe fruits, and let milk, eggs, and cheese enter largely into the diet.

It is eating for eating's sake that works most harm. It is impossible to avoid the consumption of purins. Any diet scheme based solely on its advantages relative to senile decay would be repulsive. Let us keep cheerful. Diet is not our only resource ; and, if we cannot live pleasantly, it is undesirable to live at all.

“Diet” will always be a field of acrimonious controversy.

## CHAPTER IV

Most of us have seen from time to time beautifully drawn-up statements, with columns of figures, showing how one pennyworth of this or that is equal in nutritive value to six or more pennyworth of something else. Without being intended to mislead, these statements are the opposite of reliable. To understand why, we have only to consider one or two proven facts.

As I have said, the nutritive part of any food is only that which undergoes digestion, and is made into flesh, or—to use a common term—is assimilated. Now, a great many foods, as beans and peas, contain a large percentage of material which is never digested. The tabular statements mentioned include everything in the food, without regard to it being digestible, or the opposite. Such tables emanate, as a rule, from old-style vegetarians. The more up-to-date “fleshless feeders” are better informed.

The never-ending battle between the whole-mealers and the white-mealers, between nut eaters and nut haters turns on the question whether a man can thrive on an article of diet to which he and his immediate progenitors have been strangers. To say to the average Londoner—“Live on fruit, and macaroni, because in some parts of Italy the peasantry take little else, and they thrive on it,” is as foolish as advising

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the Londoner to live on blubber, because the Esquimaux do, or to adopt yams and cocoanuts as staples of diet. In short, racial habits in foods bring about an ability to digest them. Those who cannot digest them die out. It is needless to emphasise the obvious fact that such habits are the outcome of natural conditions, as climate, and the limited character of food obtainable.

Of late years we have heard a lot about gout, and excess of uric acid in the system. It is unquestionable that such excess hastens senile decay; and it is equally unquestionable that some foods further the formation of uric acid.

The foods for gouty sufferers to avoid are: sweetbread, lean beef, lean pork, lean mutton, veal, chicken, salmon, halibut and plaice.

Foods they may take in moderation are: potatoes, onions, oatmeal, turnips, carrots, parsnips, asparagus, rhubarb, sea-kale, spinach, dates, codfish and sole.

Foods they may take quite freely are: milk, eggs, cheese, butter, sugar, white bread, rice, tapioca, cabbage, cauliflower, lettuce, macaroni, strawberries.

But general experience has exceptions. Varying degrees of ability to deal with particular food-stuffs obtain. Digestion and absorption mean work, and a consequent expenditure of body-substance. In this business the expenses must be deducted before we can calculate our profit.

Lentils, peas, beans and nuts are quite typical of foods that look rich on paper, but are dis-

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couragingly poor to the actual consumer in such a large percentage of cases that they cannot be recommended for universal use. Milk and eggs are frequently held up by dietetic experts as faultless foods. So they are—for most people ; but some persons are made ill by them. So is it with cheese. For the majority, it is one of the best foods known ; but, if given to some people a message should be sent to the doctor at the same time.

Moderation, the study of individuality, and the exercise of common-sense will yield a more satisfactory dietary than will blind obedience to theorists.

Few greater boons have ever been given to suffering humanity than the preparations : pepsin, papain, malt, and others by which it is possible to assist digestion. Like other good and useful things they have been over-used ; especially is this the case with malt. The starch of food is changed into sugar by malt. In health, the human body has a secretion that acts similarly. When the body is saved the trouble of making any secretion it *ceases* to make it, so the last state of the person who gets into the malt habit is worse than the first. Malt should be used only as an aid to digestion until the vigour of this has been restored. Hence it should be taken only under direct medical supervision.

Water is so important that it demands very careful consideration. The best water is that which has nothing in solution, but is chemically pure. No water drawn from the earth, or that

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has been in contact with the ground merits this description. Whether water is taken from well, river, pond, or brook, it is more or less contaminated by things held in solution, or suspension, or both. One may get rid of suspended matters by filtration ; but those held in solution will pass through any filter. The best possible water for internal use is that which has been distilled by nature, provided that certain conditions are fulfilled. These are that the water fall in a pure atmosphere, be caught on a clean surface, and be stored in a clean receptacle. Even then it may be desirable to boil the water. It has always to be kept in mind that water is not only a real food, it is also a preventive of disease, for when it quits the system it is heavily charged with tissue waste material, and this is the case whether the channel of its passing be the skin, bladder, or bowels.

Unquestionably, there are conditions of the system that are very greatly benefited by saline waters ; and there are other states of the body in which certain saline waters do harm ; but the body always needs more or less water that is such only, and not a vehicle for conveying other materials.

Pure water is hydrogen monoxide, with the formula :  $H_2O$ . Hydrogen peroxide has the formula  $H_2O_2$ . When, some years ago, chemists turned their attention to this liquid, hopes were held that it would prove of very great therapeutic and hygienic value. It is germicidal, and is non-toxic, even in large doses. That it has proved of great utility must be conceded,

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but it has not done so to the extent expected. Experiments carried out with diluted hydrogen-peroxide as a table water have yielded results of unsatisfactory character. When taken with foods it interferes with digestion. When taken into an empty stomach it appears to undergo no change, but to be excreted as received.

As beverages, tea, coffee, lemonade, soda-water, and beers are, one and all, to be dealt with under qualifying conditions.

In the very first place there is individuality, for there are people who can take all of these without showing any resulting harm, and there are others to whom some, or all, are more or less poisonous. This is more frequently the case with coffee than with any other on the list.

Both tea and coffee contain an alkaloid, *thein* in the former case, and *caffein* in the latter. These are strongly stimulating to the nervous system, and through this to the heart. Under many conditions they are of great use ; but as common beverages they need to be taken with some caution. They have a tendency to hinder the digestion of fresh meat, to cause palpitation of the heart, and to bring about nervousness. It is not implied that such consequences always follow their employment, but that they frequently do so. Often, they ensue from the tea or coffee being too strong, whether due to the quantity of the ingredient, or to a wrong method of preparation. It is of little use to seek high and low for ways and means of prolonging life, if, at the same time, one acts with suicidal carelessness in things commonplace.

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So with alcohol, one should exercise discretion. Strong spirits work harm. Well brewed, unadulterated beers do not. But to the individual I would say: No biological law demands that you should take any alcoholic drink. If you would rather not take any, rest assured that your abstention will not harm the system.

## CHAPTER V

THERE are two chief classes of tissue waste in the bodily economy. The one is nitrogenous, and is exemplified by urea, uric acid, urates, and certain sweat acids. The other group is non-nitrogenous, and is exemplified by sarcolactic acid, and carbon-dioxide. These must be carefully considered, for they cover the entire field of senile decay, and, when they can be dealt with successfully the problem of life prolongation will have been practically solved.

All nitrogenous cellular material contains a compound called nucleo-protein. It is the most vital constituent of the cell. Whether a cell grows larger, or multiplies, or does its own special work, *it is because of its nucleo-protein*. But the cell also contains what is really equivalent to a yeast. It is called an enzyme, and the special name given to it is nuclease. When a cell works, the nuclease attacks the nucleo-protein. The result is the production of half a dozen chemical compounds. The exact character of these depends, of course, on the seat of activity, but for any given kind of tissue the results are unvarying.

The most common of these compounds are protein, phosphoric acid, adenin, guanin, hypoxanthin, and xanthin. To the beginner in the study of animal physiology these are little more



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than names, but they are compounds that can be separated, analysed and followed out in what may be termed their chemical history. This is rather complicated, and it is not necessary for us to deal with it. Later, all the waste material forms two compounds: the one is phosphoric acid, the other is uric acid. We need not trouble about the phosphoric acid, as it very rarely plays any part in senile decay. The acid, having united with one or more mineral bases, is discharged through the kidneys, and, as phosphates, will be found in the urine.

Of the uric acid a percentage combines with sodium, and circulates for a while as the quadriurate; another percentage is transformed into urea; and the remainder is excreted in the free state.

There is nothing abnormal in all this; nothing that makes for any kind of bodily injury. The changes are wrought chiefly through the action of water and oxygen. They are carried out perfectly in early youth; and, if they continued to be so carried out the main cause of senile decay would be non-existent. It is because such reductions are interrupted that cellular injury begins. *The foe is uric acid.* There is a volume in a sentence. When this acid is *not* discharged it seizes on saline bases, and is deposited in the tissues, or it may be deposited as the free acid. It has been sometimes said that unchanged urea is never deposited in the tissues. This is an error. All three members of the series may be so deposited; the varying results depend on the region of body affected,

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and are largely governed by constitution of the individual. All are of the character known as "gouty," but quite frequently their gouty nature is unsuspected.

Nine people out of every ten—to employ a popular phrase—look for "gout" in the joints, and more especially in those of the great toe; and it is unquestionable that such minor joints are favourite situations for gouty deposits. But they may take place in the kidneys, and so bring about nephritis. When occurring in the bladder, the result will be gravel, or stone.

But these generally recognised activities of "gouty" poisoning by no means exhaust the list. So long as the poisons circulate in the blood—so long will the tissues in countless parts be affected by them. The weakened cells will be destroyed by leucocytes, or otherwise. In fact, almost anything may result, for where the body is least resistant, there it will yield to any foe, microbic or other, and that may initiate a series of "failures."

Gout always makes for senile decay, for it connotes that the chemistry of the system is weak. If this chemistry is unable to deal with cellular waste proper to the body, it will most certainly fail when confronted with the heavier and complicated tasks of digestion and excretion.

It has been said that the waste products of the second group are non-nitrogenous and are exemplified by sarcolactic acid, and carbon dioxide. Normally, the first named compound produces further carbon dioxide and water. In fact, the healthy body must carry out this chemical

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reaction, for there is no other way in which it can rid itself of sarcolactic acid. When this reaction does not take place, the acid has a special tendency to seize on lime, and subsequently to deposit the salt in cartilages, ligaments, and muscles. Thus it is that we get the group of symptoms termed "rheumatic."

Gout is very seldom seen in early youth. At this period the liver is fully capable of dealing with all nitrogenous waste. The disorder common in early life is rheumatism, and it will result from any chill. But the converse is not true; that is, later life is not immune from rheumatism; and, as "rheumatic gout" the two disorders are frequently allied.

The chief normal lime carrier of the system is fibrin; indeed, fibrin is a calcium compound of fibrinogen. Now, in later life, the quantity of fibrin lessens. Also, it is at this period that the reception of oxygen is at its lowest. We have seen that lime salts have a peculiar affinity for albuminous tissues; hence, the deposition of such salts can be readily understood.

But indeed, as I pointed out some years ago, the bodily chemistry is so complex that it could not be properly shown by a series of equations set out in straight lines. We get poisons linking up with other poisons, and becoming allies in mischief-working; so is it with the poisons of gout and of rheumatism, and then as rheumatic gout we have muscular and joint affections which justify the name given the condition.

Whether any such state will prove lethal, and, if so, how rapidly are questions whose answering

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must be governed by the extent to which vital parts are involved. A human being may live for a score of years, or longer, with joint and muscular trouble ; but if the mischief attack the heart it may prove rapidly fatal, or if it affect such glandular structures as the kidneys, or spleen a sequence of abnormalities may be brought about. Whatever be the primary seat of the mischief, we invariably find the arterial system involved sooner or later.

Unquestionably, in the vast majority of cases, these chemical abnormalities result in torpidity of the bowels, and consequent septicism of their contents. Constipation in early life is less powerful for injury than in later years. Absorption of poisons there may be in each case ; but in youth such poisons can be dealt with ; in advanced years they cannot be.

Here it may be well to briefly summarise the chief biological facts with which I have dealt.

The body is a laboratory. Among other powers it has those of destroying and excreting organic poisons. One structure so concerned is the liver. In early life this is fully equal to all demands made upon it ; but the liver does not enlarge at the same rate as other bodily parts, so a time arrives when it is unequal to the work demanded of it. This point in time agrees with that in which the quantity of fibrin lessens. Fibrin is the normal lime-carrier. Hence, the mischief so initiated moves in a vicious circle, until some one of the vital organs ceases to function. Then we have death from senile

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decay ; but, before this can occur the weakened organism may yield at some part under an attack by some disease germ. This is by far the more usual ending.

Degeneration begins when the normal powers of waste-destruction, and excretion are unequal to the supply of material. That supply is very frequently increased by a purin-bearing dietary. Very truly, the human organism may be said to grow beyond its power of dealing with the increase in toxins consequent on the growth.

We have seen that during the early years of life the body has to meet an increasing demand for nutrition, and an increasing tax on its labours for the disposal of toxins. The demand is easily met by normal means—so far as nutrition is concerned ; the anti-toxin demands are not ; and soon a point is reached when the destructor organs are unequal to the effort required of them.

If all the organs of the body retained their relative proportions there would be no such thing as senile decay. The youth disposes very completely of the waste inseparable from his diet, and his activity.

The physical differences, both to the naked eye and microscopically, between the body in youth, and advanced age are striking. In old age the figure has shortened. Apart from any fault of carriage, this is due to the thinning and the ossification of the intervertebral cartilages. Muscular fibres have lessened in number, and in size. The digestive glands of the stomach.

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have atrophied. In the lungs, the connective tissue between the air cells has increased, and this, by pressing on the breathing space, has stiffened the lungs. Arteries have undergone those various degenerative changes classed as sclerosis. Equally true is it that in all the special organs there is a substitution of inferior grade cells for those of the higher type. The babe was developed in utero, and from its birth to adult life by a gradual specialisation of cell form, and function. The adult has been making for de-specialisation. The histological side of senile decay is the victory of the connective over the specialised tissues.

All these structural differences have their chemical side. Indeed, any change in form is chemical action made visible ; and the ending, organic functional failure, is also largely chemical.

## CHAPTER VI

MANY dreams of mediævalism are becoming the commonplace facts of to-day. Witchcraft and alchemy are outdone by plain science. The transmutation of metals is an accomplished fact, although not yet commercially applicable. We appear to be on the threshold of discoveries that will render the superman more than a dream ; that will make perpetual youth a possibility.

A century ago men knew no more than they did in Galen's time why the body becomes enfeebled as the years go on. Now, as I have pointed out, they find that it is by the prolonged action of self-produced poisons. They see that in the body of a youth the organs whose duty it is to destroy these poisons are fully capable of dealing with them, but that as the body grows the chief of these destructor organs—the liver—does not keep pace in growth with that of the other bodily parts. They know that a time is reached when the production of poisons is in excess of the power of the destructors.

What then occurs is also clear ; it is the substitution of inferior, or "connective" tissues for specialised tissue. An organ, as the brain, liver, or stomach does its own proper work by means of tissue devoted to and constructed for that purpose. Connective tissues merely bind parts together.

One other result of the retention of poisons

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is the deposition of mineral salts in the tissues. Cutting a very long story short, one may say that an aged body has lost a large percentage of its specialised tissues, that very many of its smallest blood vessels are completely blocked, that larger vessels are narrowed, and that pliable and elastic parts are stiffened by mineral matters.

What is termed Hormone Therapy constitutes a very wonderful chapter in animal physiology. It tells how the body literally makes drugs, and prescribes drugs, and takes drugs; and how each drug has some special use in maintaining health and vigour. So true is all this that extracts of these glands, obtained from the lower animals, are ordered in the everyday practice of medical men.

As the body tissues in general deteriorate, so do those of the glands alluded to. Presently, their production lessens.

Science is now attacking the root problem, from which all the other problems come. It is trying to find out how to keep up the destructor action. Should this be solved most of the other problems will disappear, for the body throughout will retain the youthful character of its tissues.

It is within the bounds of probability that in the near future, although men may die from disease and accident, the mere passage of time will not affect them. It is on this possibility that the hope of a coming superman is based. Given the acquired and retained knowledge of a centenarian, and the energy of twenty-five, a man should be able to make things "move."



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As I have already pointed out, it is questionable whether bodily immortality, with persistence of environment, would add to human happiness. The question would be negatived by common instinct if the deathlessness connoted continuance of senility. Desire for life enduring has been allied to the assumption that it means unending youth.

Somewhere about the beginning of the seventeenth century alchemy itself went into the alembic. The distillate was chemistry, which has wielded a mightier influence over human destinies than ever alchemist visioned.

Had one asked a philosopher of those days : "Why does old age kill?"—he would have replied that life is a cycle, beginning at birth, and ending in death ; which is as satisfactory as explaining that a wheel revolves because it goes round.

One fact pertinent to the great question, alchemy had brought to light, the virile power of arsenic.

Volta and Galvani sent a half sceptical hope through the world of science that life's threshold had been touched. All subsequent advance of knowledge in electricity has militated against such belief.

Later than the electrical pioneers came workers who showed that all vital processes are under the governance of the nervous system ; that the body is merely this system, clothed upon with other tissues ; and who argued that dissolution resulted from failure of nerve function.

Came now the chemist, whose analysis proved

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that the chief essential of the nervous system is phosphorus, and who averred that preparations of this element would raise and conserve bodily vigour. Came also the diet reformers, the apostles of hygiene, the bacteriologists—who found a microbe for nearly every disease, the exponents of radium, X-ray enthusiasts, and ministers of the Finsen light. Came a wild horde of physical culturists.

Towards the close of the nineteenth century, a French physiologist, Brown Séquard, showed that as life advances certain glandular secretions (spermine group) lessen. He taught that the use of these, obtained from the lower animals, would prevent senility. Later, he himself died. His teaching was received with ridicule. It has since been placed in the category of modified and contingent facts.

So with the teaching of Metchnikoff, that senile decay has origin in the poisoning of the body by materials absorbed from the large intestine, and that there are means of preventing the formation of these poisons. He too died.

On all these things Science pronounces one verdict; their utility is unquestionable. In skilled hands they promote well-being, and do much both in conserving and restoring youthful freshness; but they hold no solution of the great secret.

Placental extract, obtained from ewes or cows, has been given as a powder to women. It is said to stimulate the secretion of milk; to prevent the atrophy of the uterine walls that follows extirpation of the ovaries; also, sub-involution

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of the uterus. In the hands of Petit placental extract cured alopecia that had resisted all other treatments. The Placenta has an internal secreting action. Quite often the action of Placental extract may be enhanced by the addition of Mammary extract. The dose of the dried powder varies from three to ten grains.

Hypodermic injections of watery extracts were at one time given, but have been generally discontinued, because of their tendency to set up local irritation.

Extracts of brain and nerve substance are given by intra-muscular injection. Some employ glycerinated extracts. Others prefer extracts dissolved in oil. A preparation of brain and nerve substance, preserved with glycerine, and desiccated powders prepared from the nervous system have been given by the mouth in neurasthenia, hysteria, and some mental disorders.

It was towards the close of the nineteenth century that the anti-toxic action of cerebral extracts was demonstrated by Wassermann and Takaki. They showed that such preparations would neutralise the toxin of tetanus, and the treatment has been used to produce an artificial immunity against tetanus. At the first, the blood-pressure is raised ; later it falls.

Thyroid medication controls profuse menstruation.

Ovarian extracts are given to women with some success in disorders peculiar to their sex, more especially when associated with neurotic symptoms. Thyroid extract is frequently given with the Ovarian.

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We are indebted to Von Poehl, of St. Petersburg, for introducing "Mammin," a preparation which is essentially a sodium chloride extract of the cow's udder, freed from precipitable proteins.

The use of testicular extracts is said to date back far beyond the beginning of the Christian era, but passed into the limbo of forgotten wonders. Their re-introduction by Brown Séquard, in 1889, may be regarded as the renaissance of organic therapeutics.

Histologically, each testicle is divisible into two parts, the one having spermatogenesis as its function, and the other being concerned with an internal secretion. It is said that the latter is the chief agent in bringing about the second sexual characters. When it is deficient or absent the masculine vigour is equally so. In such cases senile decay makes an early onset.

Brown Séquard's conclusions were subsequently supported by the clinical evidence of some hundreds of physicians. In one regard alone the newer evidence differed in the main from that of Séquard. He had taught that the channel of action was the nervous system; they concluded that this channel was humoral. Speaking broadly, it is now held that although orchitic fluid does not exercise any specific curative power over any disease, it has a very beneficial action on the general health when injected under the skin. This effect is held to be due to two quite distinct kinds of influence; one is exercised on and through the nervous system, thus supporting the views of Brown

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Séquard ; while the other influence results from the introduction into the blood of a new factor. The nervous action exercised by the extract is indirect. It has a stimulating power upon the entire hormone-producing system.

Many proprietary testicular extracts have been placed on the market ; some in liquid, and others in tablet or cachet form. The giving of such has proved useful in asthenia, more especially when associated with nervous disorders.

With regard to ovarian preparations, some authorities hold that extracts of the Corpora lutea are preferable to extracts of the entire ovary ; while other authorities dispute the statement.

It may be mentioned here that of late, adrenalin has rivalled the sex gland preparations in popularity. A medical practitioner of Birmingham claims to have restored the dead to life by its use.

## CHAPTER VII

WHEN a theory is put forward in any science as a working hypothesis to give cohesion to facts, and afford a guide as to further research, the one and only test of its value is the complete satisfying of these requirements. If it pass this test one need not enquire whether it is truth unalloyed. Subsequent discussions may enable us to refine the theory, and may indeed render much refining necessary. Then, in its newer presentation, the inner truth of the theory will have greater brilliancy, will be more convincing, and will be nearer the absolutely indubitable. It is essential not to misinterpret the merely tentative as finality—nor to advance it as an ultimate test of other possible verities.

We have seen all this exemplified in the atomic doctrine of Dalton. It served its purpose admirably ; and it is now as ever true in principle, if not in the letter. But we no longer regard it as universally applicable, because we have learnt its limitations. Our knowledge has passed beyond the horizon set by Dalton.

Philosophy never cured a stomach-ache ; and of all the learned dissertations that appeared before the eighteenth century it may be said—Many words, and little else.

But, as I have already intimated, the old alchemical dabblers at whom it has long been

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the fashion to sneer, had discovered many facts that proved of use in medicine, and its sister sciences. The properties of arsenic, iodine, and mercury are examples. Not any of these, however, nor the iron, cinchona, nux-vomica and other drugs that came presently into current therapeutics brought the life seekers appreciably nearer their great objective. Following the line of chemical research, one is confronted every now and again with new "aids," on which great hopes were based, which did good, but failed in attaining the great end. So was it with phosphorus in its relation to the nervous system; and so has it been with the digestive ferments, the virtues of wholemeal, and those of the vitamin bearing foods.

On each and all the same judgment must be passed.

But chemistry has not been the only field of experimental research. In the eighteenth century there was opened that of electricity. We of this twentieth century, with apparatus at our command, of which our ancestors never dreamed, may smile at the quackery and wild expectations of these early dabblers, but so may posterity smile at us.

The physical universe may be basically electrical, but up to the date on which this page is being written, the claim that "Electricity is life" has not been justified by results following its employment.

I have dealt briefly with another field of work, that of endocrinology, the science concerned with those bodily secretions that are poured

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more or less directly into the blood. Whatever may have been done in this direction before the Christian era had been either forgotten, or relegated to the museum of historical absurdities. As we have seen, it was Brown Séquard who, reasoning on a theory of probability, carried his experimental work to investigating the influence of the testicular secretions upon the bodily economy. There were those who jeered at his conclusions as the fatuous drivellings of one who was himself suffering from senile decay. There were those who saw in these conclusions the revealed secret of the long ages. Many have followed in the steps of Séquard. Many have been the variations of his teaching. It has been grossly distorted, because misunderstood. But, however presented, the teaching and the procedures based on it leave the question of bodily deathlessness where they found it. The maximum that can be claimed for the operations that have been introduced is that they bring about a temporary rejuvenation. Whether by repeating such procedures later it is practicable to prolong life is still an open question. Theoretically it is, of course, quite possible.

Equally, of course, the sexual vital secretions differ in the man and the woman. The earliest workers in this branch of physiology imagined that in the male the ordinary seminal fluid had whatever of vital power the glands could convey. Séquard's initial experiments were based on this belief. Later, he adopted another view. This regarded each testicle as having two secretions; one that passed into the system, and another



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whose purpose was the impregnation of the ovum.

Very similar beliefs were held regarding the ovaries.

The chief value of Séquard's labours is that they led to the opening up of a new field for biological research, that of endocrinology.

From time to time during the past century or so, there have been leaders of thought in things dietetic, hygienic, and athletic, and again the world has found itself facing some new physical gospel.

The day came when Sir James Cantlie thought to abolish senility by "physical jerks," but senility proved the stronger. There came that other day when Coué thought to make the body a servant of the mind, and failed. There came also the teaching of Metchnikoff, who saw in the large intestine only a breeder of putrescence. But it is doubtful whether the teaching of any one such leader of thought has prolonged human life. Very different must be our judgment regarding that other field of research—bacteriology. Here, almost from the moment when the initial experiments of Pasteur and Lister startled the world, the field of success has widened.

It is an unfortunate fact that because of the exaggeration accompanying new ideas, whatever of good they contain is liable to be treated as negligible. So was it with Coué, and his theory of auto-suggestion. As expressed by him, the theory was sheer nonsense, for there are diseases that neither auto-suggestion nor hypnotism can bring about, or cure; but, on the other hand, it

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is well known that suggestion exercises a power on the living body, and it is conceivable that by continuously drilling a child in the belief that he must die, one is fighting against his longevity. The nervous system is the servant of the mind, and the governor of bodily nutrition. Always, an optimistic mind, free from morbidity, makes for general functional well-being. But no mentality, however cheery, will produce or maintain organic integrity when the material agents are at fault.

A suggestion may be made in such a way that it will be memorised. It may be so made that, although forgotten, it may elaborate itself in the sub-conscious mind, work its way to the surface, and influence conduct. Suggestion of a sensory experience may recall the sensation. The unpleasant taste of mag. sulph. is an example; another is the shivering that results from the "screeching" of a pencil on a slate; and yet a third is the real nausea that results from thinking of something physically loathsome. A more innocent example is the secretion of saliva brought about by seeing another person suck a lemon. Blushing may result from merely hearing the word spoken. The range of suggestion is unlimited, but its power depends largely on the sensitiveness of the person.

A mental suggestion is a mental seed. It initiates that which results from it. A momentary feeling of weariness from reading a "heavy" book may begin a long sleep for the sleepless. Charcot, and other great neurologists have taken suggestion into the region of the super-normal.

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They have claimed that eczematous and other skin lesions can be produced by suggesting to a sensitive patient that they will occur. And it is a more commonly known fact that the symptoms of alkaloidal, and of mineral poisoning have followed the taking of an innocent drink, when those symptoms have been known to the drinker, and he has been told that he has taken the poison.

This is, of course, wrought by mentality. But on the purely physiological side there are activities that one must term "suggestive." Thus, torpid bowels will sometimes become quite active after a slight stimulation from a draught of warm water. One need not be a homoeopath, and may yet hold with that prince of pharmacologists, the late Lauder Brunton, that the action of an infinitesimal dose of a drug may suffice to begin very extensive intra-bodily activities, which are maintained without any direct influence from the drug.

This is in harmony with general natural law. A river seldom breaks down its banks by the cumulative force of its waters. More frequently, it first makes a tiny dribbling channel, and the forces behind it gather strength as the channel widens, until a rushing torrent results. So may the spark become a raging furnace; and a single septic or other germ begin a huge mortality.

Relatively, in dealing with senile decay, it is far more important to feed the nervous system than the general body. The latter is certain to have some provision made for it; common hunger demands that; but the nervous system

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has special needs, and, as a rule, these are largely ignored.

If it were possible to place a human body in some solution, and dissolve away all tissues save the nervous, the body would appear perfect in form, and like a thing constructed of translucent gauze.

We are not to think of the nervous system as made up of the brain, spinal cord, ganglia, and nerves visible to the naked eye. Millions of minute nerve cords, visible only by means of the microscope are distributed through the body substance. The nervous system is the governing system. By it all the activities of a myriad parts are unified into the living personality. Without it there would be physiological anarchy.

If one is depressed, stimulation of the chief organ of that system will yield relief. If one is physically weak, stimulation of the spinal cord will give temporary strength.

I am not advising the use of drugs for depression or for weakness. The facts stated merely illustrate the power of the great nerve centres.

One peculiarity of the chemical composition of nerve tissue is its richness in compounds of phosphorus. There are two compounds demanding special notice: glycerophosphoric acid, and lecithin. The great nerve centres make these.

When the vital powers are low, or, from any cause whatever, organic functions are enfeebled, it is of far more importance to feed the nervous system than to give general nutrients. Lecithin may be taken in pill form, or glycerophosphoric

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acid itself may be taken, with excess of glycerine, in water.

Diluted syrup of the phosphates is a not unpleasant drink, is quite harmless, and of some service. The hypophosphites are credited with more utility. What I wish to emphasise here is that whatever other measures are put in force one cannot possibly afford to dispense with this feeding of nerve tissue. Frequently, other means may seem to produce more brilliant results ; but no other aid is so safe, so unfailing, and so easy to employ. It is purely physiological, and is in harmony with the laws of the nervous system itself. It introduces nothing that is foreign to the body.

It is a matter of common knowledge how, when one has received a shock, or has been greatly harassed the skin becomes sagged, wrinkled, dulled, and even, in some cases, affected with a mild degree of pityriasis. So, too, the hair will become dull, lose its colour, and fall. One could multiply the details, but it is not necessary.

If further proof of the influence exercised by the nervous system on such structures be needed, it will be found in the change worked almost immediately by nerve-tissue foods ; and with the local benefits one sees an improvement in the general well-being.

It may be asked—Does this improvement extend to the functions attacked by senile decay ? The reply is : Yes, provided always that the “ patient ” does not take unfair advantage of his feeling more vigorous by overtaking his strength.

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Lives are frequently spoilt by neurasthenia. It is a factor that in many cases does not appear until the later decades. It may and often does result from tea, tobacco, or prolonged anxiety. Whatever the causation, this should be sought and removed, for a functionally disordered nervous system is incapable of doing its duty. Neurasthenia will age the body prematurely.

Nervousness is not cowardice, but it may make a person show signs that may be mistaken for those of cowardice. Every soldier who has seen service knows that the nerve-tension of awaiting an order to advance is worse than the fight itself; and, in active warfare the most highly-strung or nervous men have frequently proved the most desperate fighters.

We are accustomed to praising the so-called hero, and scorning the so-called coward. It would be as reasonable to laud a man for having blue eyes, or blame him for having green ones. Heroism and cowardice are innate. Courage is absence of fear in the face of a danger that is sensed. A man who does not sense the danger is not exhibiting courage when he confronts it. A fool may thrust his stick into a hornet's nest, without being brave.

The more vivid the imagination, the more real will dangers appear to the individual. The stolid, unimaginative person sees only that which is obvious.

## CHAPTER VIII

I HAVE already dealt with the "carat" of nutrition. Now I would speak of that which concerns life itself. In its fulness, as seen in a man or woman of good health, and at a period of early maturity, it connotes possession not merely of animal vitality, but of all those senses and powers we associate with the human ego. A being might be blind and deaf, suffering from brain-softening, yet claim to be alive. Whether we regard the "ego" as a thing of spirit and body, or as a body only, it is very questionable whether the retention of life is desirable when the mind is shut off sensorily or intellectually from its physical environment.

All sensory experiences are merely illusory, and all mundane consciousness derived from them is equally so. One could prove this by examples from an inexhaustible supply. The beautiful skin of the child is made up exteriorly of squamous epithelium. The epithelial cells are composed of molecules, and these of atoms; while the atoms have a complicated structure into which electrons largely enter. But, in gazing at the skin we see neither cells, molecules, nor atoms. All that our eyes convey to us is an impression of something that has no real existence.

So, in gazing at a landscape, we record visually trees, hills and dales; but nothing in that

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landscape is as it appears when we approach more closely. The entire thing is an illusory symbol of the reality behind it.

It has sometimes occurred to me that while millions of pounds have been spent on devising all kinds of apparatus for enabling us to hear and see things that are distant, and things that are small, very little trouble is taken to improve our own powers in either regard.

It is quite true that nothing would convert the eye into a telescope, or the organ of hearing into a telephone, but the fact remains that our macroscopic powers are less keen than those of a savage ; and, quite apart from the real power of seeing or hearing, there is an equally grave defect—that of judgment.

An Australian native bushman will point to a black speck on a far piece of rising ground, and say at once whether it is a tree, a man, a horse, or what else. It is not that he distinguishes the shape much more clearly than we could, but he knows just what a tree, a horse, a man, or other object will look like at that distance.

A mere “blur” some would say. Just so—it is a blur, but each object makes its own shape of blur.

And so each commonplace act of daily life makes its own distinctive noise. Anyone with trained judgment will know by hearing alone when a person in a near room is turning a mattress, stropping a razor, or dipping a pen to the bottom of an inkstand.

A great part of the pleasure obtainable from eating and drinking is lost, or rather—never



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arrives, because people give their attention to other matters when it should be concentrated on one sense—taste.

A delicate palate is of immense value in daily life. The power of smell is also of use. By it one can judge between the good and the bad of a host of things.

Trained eyes, trained ears, trained nose, trained palate, trained touch, and trained judgment ; he who acquires these will know much more of life in its possible fulness than will the untrained.

Even the training of these senses is as filled with gripping interest as any game of skill.

There is a rule in sight-training ; Any given object, seen under similar atmospheric conditions, and at a like distance, will always give one character of impression. Every savage understands *that* rule, and, not infrequently, stakes his very life on it.

In a very similar way, we interpret in daily life the causation of near and distant sounds. Those made by a motor-cycle, a motor-'bus, an aeroplane, and a railway train are easily distinguishable from one another.

It is in interpreting the causation of slighter sounds that we most frequently fail. Yet every audible motion has its distinctive sound, and often the ability to assign some one sound to its true cause may mean the preservation of life.

Here is a simple way of training the hearing sense. Two people agree that each shall go alone into a room, the two rooms being adjacent. One person is to *do* things ; the duty of the other

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is to listen and to judge what is being done. The actions should be just audible.

It may seem strange, but it is true that spoken words are far more likely to be confused with others than are inarticulate sounds. With most voices it will be found that the initial syllable of a word is the most difficult to distinguish. Terminal syllables are comparatively easy. This is scarcely stating the matter strongly enough ; for it is the initial sound of a word that is the most difficult to distinguish. Thus—Nay, May, Pay, Day are easily confused, but in each case the “ ay ” is distinct.

Loan, moan, sown, and down give only the phonetic “ own ” with certainty. With some speakers both initial and terminal sounds are indistinct.

The old saying that the savage is closer than the civilised man to Nature has a breadth that is apposite to the question under discussion. The savage is an impressionist. The flight of a bird ; the manner in which the grass has been trodden, and the breaking of a twig are to him *symbols* of unerring meaning. He is by nature a scout, to whom each sound and sight and odour tells a story.

I have been speaking of the adult ; but it must be insisted upon that if we would have the body and its powers at their best we cannot begin training at too early an age ; and the first fact that those who have any interest in the men and women of the future should appreciate is that it is absolutely *impossible* for any child possessed of normal senses *not* to be trained. A child is

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always acted on by its environment, and has its body affected by it, for good, or for ill. There is no getting away from the fact ; it is as certain as any law in chemistry or physics. A child that is not given any intentional physical training is left to the chances of its environment, and its inherited tendencies.

While the object of all physical training is a good development of all organs, parts, and functions the ideal aimed at should not be a rigid type, for there are differing types that may be equally "good." Thus, there may be the tall, the short, the slender, and the full-fleshed.

The more a child is left to the teaching of nature in the first few months of its life—the better. Let it kick, and plunge ; it is feeling its own strength, and adding to it. On no account should mother or nurse try to teach a child to walk until it can stand erect unaided. To let a young infant bear on its feeble legs the weight of its body, while preventing it from falling, is a very common practice, and it is a sure way of bringing about malformation of the legs. The bones of an infant are largely made up of yielding, soft cartilage.

Inherited instinct will lead the babe to attempt walking, and this will be accomplished without injury when the lower limbs have a development that can support the body without difficulty. Only when the child can walk quite freely should the systematic muscular and joint training begin.

Muscular exercise makes for good form of body by increase of size in the parts exercised. It also

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makes for better quality of muscle, for it rids muscle of fat, and it increases the vigour of the blood circulation. This, in turn, stimulates vital organs, as the liver and the kidneys, to do better work. A well-exercised body is in every way healthier than the same body would be, if unexercised. But, on the other hand, it must be kept in mind that exercise is *work*, and therefore results in the production of toxins. Toxins brought about by play are as harmful as those resulting from the labour necessary for subsistence. Frequently, children over-exercise.

The two most important regions in physical life are the chest and the abdomen. With regard to the chest, it is cubic capacity that has chief importance. In the case of the abdomen it is not size, but the strength of the muscular wall that counts.

Many persons are deceived with regard to the results of dumb-bell work and drilling. They see the shoulders broaden, and so think that the chest is enlarged; but the enlargement is usually exterior to the chest, and of no great physiological benefit. For genuine increase in chest capacity nothing equals breathing exercises, carried out during several minutes three or four times daily. The lungs should be slowly inflated to their full capacity, and the out-breathing be made as slowly. It has been argued that games are equally beneficial; but that is not so. In all games, the breathing—although much quickened, is shallow.

Right carriage is of importance. The child should not be allowed to walk with shuffling

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• step, with the head lowered, and the shoulders forward. Drilling should be made of interest.

To put heavy boots on a weak child, and expect it to lift its feet in the normal manner is cruel. So, when the back is really too weak for the correct sitting position to be kept, the spine should be supported with a strong back-stay, or the chair be so padded that it may afford support.

If grace of movement is desired, nothing will be found to equal dancing. It yields to the child a sense of muscular control quite distinct from mere strength. It gives him poise, ease, and that physical self-mastery which is the opposite of clumsiness. The old-time dances were more perfect in these regards than those of to-day. A well-danced minuet is beauty of movement. Possibly, the waltz comes next. But such questions are matters of opinion.

All the things that make respectively for good form, right carriage, suppleness, and grace of movement help one another. One might drill a child daily in the school yard for years without removing his clumsiness. One might teach a child to dance perfectly, without him learning to walk and sit correctly; and so to the end.

It goes without saying that an elastic exerciser is of wide utility. But writing as I do chiefly for the advantage of the moneyless majority I would lay emphasis on the fact that no single game or sport is the equal of wrestling. Little children of tender years may be taught to pull and push one against the other, to grapple, and attempt a successful throw. On soft grass, or rugs—no

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dangerous furniture being near—the falls will not hurt.

We are so accustomed to think of strength and speed as desirable, that we frequently lose sight of the fact that slowness and steadiness may sometimes be of greater value than either. For every hundred people who can raise a heavy weight above the head not more than a small fraction will be found capable of threading a needle at the first attempt. The one results from sheer strength—the other from having muscles under perfect control. Some of the greatest feats of the gymnasium demand very little muscle, but they are impossible without its steady obedience. It is muscular discipline that tells far more than mere strength in the fine arts, and in such sports as golf, tennis and billiards.

\* Inexpensive aids to muscular discipline are always at hand. One excellent means is to fill a teaspoon so that it will not hold one drop more, and to hold the spoon without spilling one drop of its contents.

In hot, cold, miasmatic and other regions, Nature has followed her law of killing off the unfit, and from the survivors producing a race that can thrive locally. One cannot take a child from—say—a mountain side, descended from long-time dwellers there, and transfer it to a fen district, without grave risk. Inherited fitness, and unfitness are hard facts.

“Hardening” means that by exposure of the body to heat, cold, wind, damp, or other such influences it will become less susceptible to them, and even immune from injury. It is argued

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that the persistence of peoples exposed to such influences proves that the teaching is right. We have just seen why it is wrong, for such peoples are the descendants of the surviving "fit." It is impossible to do in one generation the work that it has taken Nature thousands of years to accomplish. Hardening is a detail that must be dealt with on sound, commonsense principles. If not, trouble will follow.

For example, there are parents who boast that they can send their children bare of foot into the snow without any ill result. If the exercise taken is very brisk, it will add to the body-heat, and so there may be no general sensation of chilling; but there is a chilling locally, and a consequent grave interference with the bodily chemistry. Such "hardened" children may gradually acquire immunity from catarrh; but, a few years later, the greater number develop rheumatism, which is not confined to the joints and muscles. Heart complications are frequent in later childhood.

I am writing that a rising generation may not only retain its life, but have a life worth retaining. Therefore, I urge that your motto should be: "Harden, *but* shield from injury." See to it that there is never any local chilling, or local over-heating. Send the child into the sunshine, but shield the head, and the eyes. The contrary practice may induce permanent changes in the blood supply of the brain, with attacks of giddiness, headache and vomiting.

What we adults have to keep in mind is that extreme cold and extreme heat *always* fight

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against body health, unless their influence is modified. Carefulness is not coddling.

The children of to-day are the men and women of the coming time. Give them a chance of having a life *worth* the keeping.



## CHAPTER IX

CIVILISED society is undergoing a rearrangement of its components into aggregations more cruelly contrasting than those resulting from wealth and poverty, learning and ignorance. The newer cleavage is vertical, extending through all social strata of rank, and it is being wrought by Nature.

Not only in slums of the city, but also in the homes of its moneyed residents, in cottages of the peasantry, and wherever else men, women and children live, Nature is making her just, but unequal divisions, giving to some that type which is, so to speak, the high-water mark of physical excellence, and to others types that show varying degrees of declension.

It is the old story of seed-time and harvest, whose truth is being demonstrated to-day. The child starts in life with a physical inheritance, but the conditions obtaining in him are not those obtaining in his ancestry. They sowed the seed ; he reaps the harvest. They put causes into action ; he receives results. Whether the operative forces were hard drinking, gluttony, over-taxing of brain and nerves, the softer physical sins, poverty of nutriment, or aught else, they have done their ill work. Whether they were the open air activity of sailor and sportsman, temperance in things dietetic, and in things emotional, they have done their good work.

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They have sent down to the child born in these days that which lay in them to be sent.

Always, presumably, there has been the breeding of decadents ; a breed repeating itself through two or more generations, but tending to extermination, and maintained—if at all—by the influx of decadents from other sources. If we ask whether the cleavage has in any past age equalled that of the nineteenth and twentieth centuries, the answer is—*no*, and the causes of such a difference obtaining historically must be sought in the comparative life conditions of the far past, and those of the more recent years. The nerve strain of money-getting, whether it be for fortune, or bare subsistence has become progressively greater since the introduction of steam, and its successors into commercial life. And although year by year, tremendous strides have been made in the direction of affording facilities to all who seek the ways of health and vigour, the absence of all compulsion to right living has left the sluggard slacker free to wallow in pestiferous inertia.

Not only is the physical equipment of the child of ancestral provision, the direction of his life energies has been determined ancestrally. His impelling instincts towards the virtues and the vices—towards whatever conduct characterises his personality are tendencies begotten of habits in those now dead.

I have made myself familiar with the proximate and remote effects of various methods, dietetic, muscular and other under which children are trained. I have seen that for the putting-on of

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tissue, and so for getting large measurements of limb-girth, and high weights feeding on large quantities of starchy and protein foods, and a rigorously enforced system of muscular exercise are effectual; but I have never found the children have the strong vitality of those bred under natural conditions, as on a good farm, and under no "system" whatever; who have eaten and drunk their fill, regardless of all theories; who have played their rough and tumble games, and who, later, have done their share of hard work.

If we feed a child with so much protein, so much carbohydrate, and so on, and deem that we satisfy the requirements of nutrition we are assuming that our physiological knowledge is co-extensive with physiological fact; an extremely doubtful supposition.

The natural truths, bio-chemical and other, covered by good farmhouse fare, play and work, are co-extensive with the biological demands of the body. That was so before vitamins were discovered, or radio-activity came within the field of knowledge. It will be so, whether we learn or remain ignorant of other truths hidden within the things that we call commonplace.

Regard for a moment the absurdity of telling people to acquire the *habit* of breathing deeply. Reflex controllable movements are best carried out when uncontrolled, and the mind is unconscious of them. Respiration so studied and practised as to be habitually changed in character tends to hysteria and insanity. Neither is it rational to suppose that the inflation and de-

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flation of the lungs during some few minutes daily will materially affect the elimination of toxins.

Of course, increased respiratory efforts tend to do that, but the best effects are gained by games and sports that bring the respiratory muscles into play. In tennis, rowing, swimming, running and others of their kind we have means that never fail us, and that do not trouble us to think about our respiration.

What does it all come to? That Nature during these million or more years past has made for good, and has given the instincts that demand it, and the means that satisfy the demand. The Mind that created her laws knows fully, and we know only in part, and the result of trying to substitute our poor little fraction for the integer is *failure*.

And so, recognising that *we* are responsible for the welfare of the coming generations, my plea is for obedience to all-sufficing Nature, as against obedience to enunciations which presumptuously delimit her, while professing to teach the entirety of her law. It is for games and sports as against the artificial system of the gymnasium. It is for a common-sense satisfying diet as against a feeding with proximate principles by the gramme. It is for the wholesome exercise of the reasoning powers in subjects such as mathematics, as against the sickly attempt to explore the very channels of thought, and to peer at oneself in the dim mirror of the mind. It is for the simple rules of life purity, and of temperance as against the effort to place sexu-

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alism within the cold-blooded list of cytological, glandular, reflex, and tactile functions. It is for the old way as against the newer way that I plead ; for the old way is that taught by Nature, and this is the materialised thought of God.

Scores of volumes have been written which deal more or less exhaustively with the nutritional demands of the body at all ages. The laws of metabolism, the ratio of nutritional repair to nutritional waste—technically, that of anabolism to katabolism—have been so clearly formulated as to yield data for drawing up diet tables which have satisfied the most critical inspection—when made by those who have started with one or more assumptions.

In the early days of modern physiology the science of chemistry settled the two questions of bodily waste-excreta, and the composition of food-stuffs. Nothing could be simpler, nor more convincing than these analyses—*on paper*. One expended so much body substance, and here was a nutritional food value to make up for the loss. That sufficed for the adult ; and in dealing with the growing child one had only to add a small percentage to the nutritional demand.

For several decades the teaching was held to be gospel, and countless writers on dietetic reform devoted their energies to booming the great potential nutritive worth of some food-stuffs, as dried peas.

The next advance was when men found that the nutritional power of a food did *not* depend on its chemical elements alone, nor even on its percentage of “proximate compounds.” Of

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two foods, one theoretically richer—this frequently proved the poorer.

Why?—Because its physical state, that is the micro-structural character of it, rendered it in great part unsuited for digestion. Hence, some quantity never became part of the body, while it took from the body a considerable expenditure of energy, and digestive material, these being, of course, wasted.

When this knowledge spread, the "gospel" of old style vegetarianism was forsaken by science. Now there came a further advance. Expenditure was to be satisfied by those foods which afforded the greatest nutriment, while making the least demand on the system.

Here, surely, was a perfect dietetic scheme. But this also broke down. The children trained in accordance with it put on fat. They acquired a skin like satin. But it was found that they were often deficient in disease-resisting power; and that any deviation from the diet occasioned dyspepsia; also, that they seldom developed into vigorous adolescents.

Something had been overlooked. The expenditure, the income, and the cost of utilising this income did not cover all the facts concerned in nutrition. Through tens of thousands of years the digestive organs had been accustomed to deal with *refractory* foods. They had acquired and had transmitted a demand for them.

The relationship of the digestive organs to digestive work is very similar to that of the muscles to muscular work, or of any other organ or structure to its special work. As the demand

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is, so is the power to meet it, and this connotes the increased development of the structure.

But work does more than this ; it increases nerve vigour. That is true of all the non-toxic forces that are—at first sight—inimical to well-being.

Cold, and more especially cold winds must be regarded as injurious to the inactive man. But when exterior cold is met by active exercise the body health is promoted. One sees this in the hearty appetite, the improved spirits, the glowing warmth ; indeed, in the entire vitality of the person.

Therefore, in formulating any scheme of diet one must look not only to potential nutritional values, but also to the benefit resulting from the work of digesting the foods.

So, in choosing a diet it will always be found best, after early infancy, to avoid those tables wherein the milk and the starchy foods so predominate that the commoner and coarser food stuffs are almost negligible. It is for such reasons that the diet of the farm-house, as it is called, has such a deserved repute. Inherited ancestral abilities render it the one best suited to the body. *It demands work of the system ; but that work is, in itself, beneficial.*

It is a physiological heresy to regard the labour of the digestive organs merely as a service to the other parts of the body ; as great a heresy as it would be to consider the benefit resulting from muscular work as limited to body parts that are not engaged in the work. Just as the muscles benefit from work, so do the organs of digestion.

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Scientists who have studied things psychical, as well as those that are material, know that the two universes correspond. Each law, or factor in the one is represented by a similar law or factor in the other.

And, in this regard, it is of interest to note the opinion held by the great teachers, Buddhist, Jewish and Christian, that psychical strength results from battling with and conquering forces of evil.



## CHAPTER X

“ENDOCRINOLOGY” has been erroneously defined as the science that deals with ductless glands. Very certainly, it does not deal with these exclusively. While it is quite true that there are several glands whose secretions are in their entirety passed into the blood, and that such glands merit, from their structure, the description—“ductless,” it is equally true that there are other glands which are possessed of a double function, the one concerned with digestion, or excretion, and the other with the production of one or more chemical compounds that pass directly into the blood.

Endocrinology is the science that deals with endocrinous secretions, and the structures producing them. The number of such glands known to us as exclusively engaged in this class of work is very small. Possibly—it may be only fractional of the number obtaining. They are of sufficient importance in the bodily economy to demand especial attention from all who would understand the general schema of its physiology, and the material agents concerned in human psychology.

Listing the chief of these glands we have; the thyroid, and the two para-thyroids, situated in the neck; the thymus, at the back of the sternum in the chest region; the pituitary and the pineal,

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within the skull, at the base of the brain ; the adrenal glands, two in number, one in connection with each kidney ; part of each ovary in the female, and part of each testicle in the male.

Two organs whose part in digestion is of the highest importance—the liver and the pancreas—have each an endocrinous secretion.

The thyroid is especially-necessary for a normal and wholesome personality, both physical and psychological. Absence, or deficiency of the gland has for accompaniment what is termed "cretinism." The body of the cretin does not attain a normal growth, the face is shrivelled, the skin itself appears to be too dry, and the mentality is not up to the standard. The cretin invariably derives benefit from taking a preparation obtained from the thyroid of one of the lower animals.

On the other hand, there may be an abnormally large thyroid, or one that from some cause is over-active. Then the mentality is over-stimulated, but the stimulation does not necessarily produce high intelligence. What it always does bring about is an increase in emotionalism. The subject tends to become more irritable. Such a change is seen very frequently when anyone is undergoing thyroid treatment.

Thyroid extract is now given medicinally for many disorders of the system, and should always be handled with the same care that one would bestow on any poison, animal, vegetable or other.

The thyroid gland weighs about one ounce in

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the adult, is rather heavier in the female than the male, and usually increases in size during menstruation and pregnancy. Frequently, smaller glands, whose secretions are of the thyroid in character, are found near the large gland.

The thyroid does not fail functionally, nor decrease notably in size because of advancing years. In the normal individual, no thyroid medication will in any way retard senility, promote vigour, or aid in restoring youth.

The pituitary gland has two parts, or lobes, and the secretions of these differ in function, but both are concerned with growth. In the present state of our knowledge one is not justified in recommending treatment by pituitary extracts save as a rather desperate and experimental procedure. Very similar remarks apply to the pineal gland.

The adrenal glands exercise an immensely important influence on the bodily economy. Their chief secretion, adrenalin, can be prepared synthetically, but no administration of this, nor of the gland has aided the fighter against senile decay ; nor indeed have we any reason to believe that atrophy, or failure of the glands play any leading part in the coming of senile decay.

*The Sexual Glands.* These, the ovaries in the female and the testes in the male, are collectively spoken of as "gonads." They have very distinct and varied functions. The prostate gland is not usually credited with having an internal secretion, but the production of this is highly probable.

The ovaries give origin to ova ; the testicles

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to spermatozoa ; this is the generative function. Certain cells of the ovaries, and of the testicles have an endocrinous secretion. It is this which has come most prominently into view of late as the dominant factor in maintaining the balance and vigour of the many physiological activities, *but this is not because such secretions are really of dominating importance.*

The truth appears to be that there is an endocrinous *system*, whose glands or cellular loci are interdependent. The endocrinous *system* is necessary in its integrity for the perfect functioning of any part of it, and for the perfect functioning of organs and tissues that are *not* endocrinous.

The procedures in connection with the hormone produced by the testes that are put in force with the view of preventing senility, or of restoring youthfulness are the following :—

1. Ligation of one or both seminal ducts, which results in the atrophy of the sperm producing cells, and the proliferation of those of the interstitial glands, that is—of the cells engaged in the endocrinous secretion. This does not introduce the risk of bringing any new factor into the personality.

2. The “planting” within the scrotum or elsewhere subcutaneously of one or more testicles obtained from a youthful human subject.

3. The removal of the testes, or the removal of one testis, and the placing within the scrotal wound of a gland or glands, as in operation (2). These two methods do introduce a factor foreign to the personality

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4. The subcutaneous "planting" of monkey glands in some part, scrotal or other. This is a course open to strong criticism.

5. The employment by subcutaneous injection of a serum prepared from the testicles of stallions. This, at best, is of temporary service only.

The operation described under (1) is known as Steinach's. This was first tried on rats. Steinach based it on the theory that if the avenue for the discharge of semen were occluded, the production of this would cease, the producing cells would atrophy, but the associated cells devoted to forming the endocrinous secretion would proliferate, and secrete more abundantly.

Steinach's observations satisfied him that the operation always resulted in the bettered general condition of the rat. Then came, in each case, the post-mortem examination, and this proved his theories to have been correct, and his prophecies to have been accurate. In due course, the application of his knowledge to human subjects followed. No confirmation by autopsy being possible, reliance had to be placed exclusively on the evidence offered by the living subject. In every case this great biologist found improvement in vigour, and an approach to youthfulness.

The operation is simple. As a rule, one vas deferens is ligatured. In such case the patient not only remains a potential parent, but that potentiality is greatly increased. Some surgeons tie the vas outside the inguinal canal; others prefer doing so within the scrotum.

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The injection of serum, mentioned under (5) is a procedure introduced by Dr. Henri Spahlinger, a well-known bacteriologist.

Ovarian operations have been tried, and, in the main, the results have been satisfactory. One Manchester surgeon and obstetrician has transferred the whole of an ovary, and in some cases a part of one ovary from one woman to another. By such means he has rendered sterile women potential mothers, while adding to their youthfulness.

The pancreas is one of the glands with two secretions; one concerned immediately with digestion, and the other endocrinous. The name given the latter is "insulin." It is said that the lessening of this secretion is the most common cause of diabetes. The disease has been cured by giving insulin obtained from the lower animals.

The giving of placental extract, obtained from cows, has been found to stimulate the secretion of milk. "Beauty" doctors may be interested in noting that it has proved useful in alopecia. The dose of the dried powder ranges from three to ten grains.

What of the mammary glands of men? That they have such glands many biologists seem to forget. Possibly—I have not the remotest evidence on the question—the structures are endocrinous.

Extracts of brain and of nerve substance are given by the mouth as stimulants and foods in neurasthenia, hysteria, and some mental disorders. It has been found that extracts of brain substance have a fixing action upon some toxins,

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as that of tetanus. This treatment has been employed experimentally to produce an artificial immunity against tetanus.

Thyroid extract has been used to modify excessive menstruation. It may be combined with ovarian extract.

“Mammin” is the name given to a sodium—chloride extract of the cow’s udder, freed from precipitable proteins.

Orchitic extracts have been given by the mouth with some success. They have proved powerful tonics and stimulants.

### TRANSFUSION OF BLOOD

Some very wild statements under this heading have been made from time to time. The blood of the lower animals is never identical in character with that of a human being. Only in very extreme cases, and then with full recognition of its risky character, should direct transfusion of such blood be tried upon the human subject. The sheep is its best source.

Even the blood of any two people is seldom so similar that the fluids will mix as if from one source. Most frequently, the injected blood is treated as “foreign,” that is, it clots, and has its red cells broken up. In fact, it works more harm than good. Near relatives may have very different characters of blood. After a large number of experimental tests we have, fortunately, arrived at certain general principles, which have proved of immense utility in real emergencies.

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I will content myself with citing Jansky and Moss, who are regarded as supreme authorities on this question. They divide human beings into four groups. The blood from group 1 is poisonous, save to its own group. That from group 2 is safe for groups 1 and 2. That from group 3 is safe for groups 1 and 3; while that from group 4 is safe for all.

Happily, we do not need to transfuse blood in order to test its mixing property. All we have to do is to add a drop or two of the donor's blood to a little serum obtained from the recipient—and then use the microscope.

A medical student of Glasgow, J. R. Learmonth by name, placed certain facts beyond all dispute. He showed that blood character was determined from birth, and that inheritance followed in obedience to Mendel's law. Thus, two parents belonging to group 4 could have children of the group 4 blood type only.

In taking leave of this subject I would state my personal belief that just as the digestive canal is the natural avenue for ordinary nutrition, so it will ultimately be found the best, and the safest channel for administering whatever aids we wish to press into our service as nutrients for prolonging life, or restoring youthfulness. Our chief problem is to find nutrients with which this natural absorbent channel can deal rapidly and efficiently. Guessing—but only guessing—I think that we shall arrive at success through the scientific chemist and his synthetic preparations.



## CHAPTER XI

WISELY did the old alchemists speak of man's body as the "microcosm"; that is, the microcosmos; the universe or cosmos, in miniature.

Having regard to the limited range of their practical knowledge, the term was marvellously accurate. Man's body is the cosmos on a small scale. Let us consider why, and how.

Every form of energy found in the great universe obtains in this body, but reduced to a safety point. The sun's heat is the source of man's life, but that awful temperature becomes only\* 98.4 F. The sun's light is his light, but not at the speed of 186,000 miles per second. His nerve force—whatever that be—makes its way along his nerve trunks at a speed ranging from 35 metres to 140 metres per second. An electric current travels these nerves at a very similar rate, whereas it will pass along iron wire at about 17,000 miles per second. His muscular contractile frequency is about 12 per second. His susceptibility to poisons is remarkable, or to put the matter otherwise—his power of taking poisons without harm is very limited. In many cases the forces of the living human body are those of nature reduced to a minimum. Often, they cannot be safely applied unless led-off from

\* The body temperature is usually given as 98.2 F., but this is when taken in the mouth, or the axilla. Normally, the blood temperature is slightly higher

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safety mains. Thus, is it with potassium. Crude potash is always risky; potash-carrying plants are never toxic because of their potash. Sulphur depresses the mentality and irritates the intestines. The onion, heavily charged with sulphur, does neither.

It is, I suppose, to Becquerel and his school, that we must give the credit for that modification of the atomic theory which teaches that atoms are composed of electrons, and that electricity is the electron in action.

Ultimately, therefore, all matter is electrical.

All electrons are assumed to be alike. Each is supposed to have a mass equal to about the two thousandth part of a hydrogen atom.

Ionic medication is the application of an electrolyte, that is of a chemical in solution, by means of electricity and assumed to be carried thereby into the body.

The living human body is always in a state of electrification. The electrical discharges of the body are in closed circuits. It is possible to convert the body, experimentally, into something very like a Leyden jar—if insulated, and from it to give a second person an electric shock; but this is not to follow any law of animal physiology; it is to introduce the clown into the temple; and to play the fool with its mysteries.

The application of what is termed “high potential” may or may not be justifiable in such cases as paralysis; this is for the medical practitioner to decide. All I have to say is this: high potential does *not* promote general nutrition: it does not aid those metabolic processes we

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associate with youth ; it neither conserves them, nor restores them when lost. An aged and enfeebled body, treated with high potential has a tendency to cardiac failure.

Some years ago I said in an article contributed to the *Dublin Journal of Medical Science*—

“I do not think that in high frequency we have any correspondence with a single biological frequency. I defy the advocates of it to find a single human activity harmonising with it ; and I hold it to be irrational to thrust a new law of frequency upon these activities.”

What I then wrote I can now repeat, but with more emphatic certitude.

Electro-therapeutics is a science having a great many hard names, expensive apparatus and big blunders. It has been frequently at loggerheads with physiology ; for the chief “laws” of electricity are facts observed in metallic media, and animal bodies are not affected in the same way. Hence, the attempt to extend the action of such laws to animal bodies has resulted in failure.

As cold fact, while much good has been worked physiologically by electricity ; a great deal of harm has frequently resulted from it. I may here point out that in all the many functions and periodicities of the animal system, there is nothing resembling the interrupted current, be it Faradic or magneto-electric. The interrupted current gives a rapid series of sharply stimulating electric shocks, but they are not of universal benefit. Unquestionably, they are frequently of service in cases of localised muscle and nerve atony ; but

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when the object is to improve the nutritional tone of the entire body, the ordinary Galvanic current is preferable. Good results are proportional to length of application rather than to the number of cells.

It should be kept in mind by the user, the nurse, or whoever is applying the current, that this will always tend to complete the circuit by the pathway that offers the least resistance. Thus, in dealing with one leg, a terminal may be beneath the foot, and the other terminal be applied to the region of the sciatic nerve, yet the passage of the current may be nearly or completely cutaneous.

Very many, and highly interesting experiments in electricity are open to the physiologist. It offers a wide field for research, but it has not hitherto yielded results that encourage us in hoping that we shall be able at a near date to derive our "vital force" directly from the electrical.

## CHAPTER XII

SYNTHETIC chemical preparations reflect great credit on the skill of the chemist ; but such preparations very seldom equal those for which they are substitutes. The " why " of this is not easily determined. We shall probably be near the truth in assuming that in any such case the original analysis was faulty ; if so, the synthesis cannot be right.

I have urged again and again when dealing with the nutritional values of food stuffs that the only safe avenue for ingestion is that given by nature—the digestive canal. The attempt to " feed " by intravenous and hypodermic injections is merely a desperate expedient for extreme cases.

What is thus pumped into the blood stream or flesh is so much foreign material. It is never identical with anything found in the living body. Always there are differences between even the simplest animal product as it obtains in the living flesh, and as it obtains after it has been extracted. Hæmoglobin offers a good example. As it is found in the red blood cell it is fitted for all its potential purposes. But when given from the outside it is of no more utility than any one of many other supposed " nutrients "—that is substances whose nutritive powers are deduced from chemical composition. When injected subcutaneously it is nothing else than so much *waste*, and is dealt with as such.

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In the extremities confronting the surgeon and physician ; when the choice is between letting the patient die, and affording him some faint chance of retaining life any risk may be justified, but from the physiological standpoint only procedures in agreement with the laws of human physiology are justifiable, as tending to unalloyed good ; and one such is confining the giving of nutrients to such avenues as nature has provided. The normal is, of course, the oral ; the one most nearly approaching this is the rectal.

Very similar considerations should guide the physiologist in the use of electricity. He is not acquainted with all the subtleties of the electrical laws obtaining in living nerve, muscle and other tissues ; and such knowledge as he has acquired should incline him to " feed " the system from a safety main, and let the body deal with its supply as it does with other sources of energy. Putting the matter into practical shape ; a mild galvanic current, applied by broad electrodes, during several hours daily will be found more satisfactory than any " heroic " treatment. The great nerve centres concerned with the electrical economy of the body will attend to the utilisation of the current.

I am frequently asked—and in a tone that tells of scepticism—whether there is such a thing as " mind force," and, if so, whether it can and does work the physical good and the physical harm that some writers on psychology attribute to it.

Replying here, I say : take the evidence of any number of neurologists and you will find that the

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majority affirm that whatever is cheering to the mind will give colour to the cheeks, light to the eyes, and a feeling of increased vigour ; while whatever is a mental depressent writes its message in such signs as lined face, grey or whitened skin, dulled eyes and lustreless hair.

The neurologist and the unlearned man in the street know equally well that good news and bad news act respectively in these ways. Between the tissues and the centres of consciousness are the nervous paths. Mind has its force, not necessarily a specialised thing, but as the obedience of nerve force to mental power. While it is an act of folly to live a lie as one does in auto—or for that matter hetero-hypnotism, and as is most certainly done when, knowing oneself to be a physical sufferer, one yet seeks to force oneself or be forced into the belief that one is not such, it is wisdom itself to seek all the cheering things compatible with truth.

Mind force is second in power to no other force, be that electrical, chemical or other.

Quite often one finds that hidden away in the mind is some utterly absurd terror which comes to the fore in every time of sickness, however trivial that sickness may be. In one such case—quite typical—the sufferer, could not see a certain kind of loaf without wishing to seize it, and hurl it at the nearest person. He himself could not find the origin of the impulse. This came to light when, having been hypnotised, he described how—just as such a loaf was being handed him at the front, there came a charge of the enemy. Hypnotism cured this case.

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It has been urged by many that the employment of agents, whether chemical, electrical or other, that immediately and powerfully add to the vigour of the blood circulation may prove dangerous when that very common condition of senile decay known as arterio-sclerosis is well established ; for here the inelastic vessels may at some point rupture, and any such rupture, occurring cerebrally, will spell apoplexy, or, if in the eye may cause blindness. And, as a consequence of such opinion, it has been argued that before any attempt to increase the general vigour is made one should endeavour to improve the arterial walls. To this end, agents such as the following have been recommended :—

Sodium chloride, carbonate, nitrate and neutral phosphate ; magnesium phosphate and calcium glycerophosphate ; to be taken together in tablet form. Others deny that any benefit results from the treatment.

The relationship between the sperm fluid proper and the psychology of the individual secreting it is as close as that between brain and personality ; and the endocrine secretion of that which is, after all, a part of each testicle must be closely allied to the personality. I touch on the point because the question is so frequently raised.

The plain truth is that after any operation in which a sexual gland or any part of a sexual gland is implanted in the human body, there may be psychical tendencies of changed character.

Has colour a mental effect, or is the assertion an invention of empirics ?

It is quite true that colour has a great influence



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over many minds ; but it is equally true that all minds do not react uniformly to any one colour. Thus, some find blue restful, but others dislike it. Some persons are cheered by red, and others are made irritable or angry by it.

There is another theory, which has been exploited in America, and concerning which I wish to make only the baldest statement, without any expression of opinion. Popularly, it is called—"the vibration cure." Its authors are, I believe, two medical men. The theory claims to be based on the electronic constitution of blood and other cells. Each variety of cell can be made to give its own peculiar vibration, and in some way that is not at first sight very obvious, the vibrations can be made to restore one's lost youth, and cure disease.

Very recently the question has been raised whether there is any physiological justification for giving adrenalin to a patient suffering from cardiac disease.

My reply is—yes, but not as a routine procedure. Adrenalin is a very powerful cardiac stimulant. It is the sort of remedy that should be kept at hand for use in an emergency, when such emergency is likely to arise. It is a strange drug, but I have very strong doubts as to it acting as some therapists have claimed.

A man leaps aside to avoid some threatening peril. The entire procedure occupies less than two seconds ; yet it has been asserted that the man's action has been brought about by an extra outpouring of this adrenalin, and its action on the motor centres governing muscular action !

## CHAPTER XIII

THE question—What constitutes a “year” of human life? is one having a peculiar interest, whose correct answering may bring us a good deal nearer to physiological truth.

The unit of time measurement called a “year” is the interval between any moment when the earth and the sun hold relative positions, and the moment when these positions must next obtain. This unit is purely astronomical; it marks a recurring fact, and the fact connotes a certain quantity of terrestrial work. The duration of the earth from its genesis could be set down in terms of “years,” that is of revolutions about the sun.

Equally as a fact this astronomical year from any day of any month to the corresponding day and month indicates for the mass of vegetation a recurrence of life conditions. Less broadly, but still with broad accuracy, it points to periodicities in things climatic.

We are accustomed to speak of human life duration in terms of these years. Are they scientifically applicable?

Let it be kept in mind that we are using a unit which accurately represents *world* work, an expenditure of *world* energy, a definite stage in *world* history.

Does the year equally express *body* work, an

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expenditure of *body* energy, a definite stage in *body* history? Is it synchronous with any recurrence or obtainance of facts in human biology? If it is so, our term is admirable; a time measurement applicable to truths sidereal, and to truths biological; an ideal unit.

But if the case is otherwise: if, when we say that a man is fifty years old, we state merely that he has existed during a time space in which the world has performed so many revolutions, and the units of this time space do not synchronise with the facts of his body life, the application becomes absurd.

Should it be shown that a third possibility obtains as fact, that there is a true unit for human-life measurement, a unit marking in its multiples and dividends vital phenomena, then, very obviously, the finding of that unit will enable us to estimate life duration in terms of scientific accuracy.

I would, in passing, emphasise the truth that each of those linked sequences we classify as "sciences" must be studied from within. Not one can be interpreted by another science. To the pure mathematician, knowing nothing of the laws of motion, it is obvious that if a cannon ball be fired into the air-at any given speed it will attain a certain height by travelling at its initial speed. The mathematician would be equally wrong in dealing with chemistry were he to estimate combining weight from percentages. So one who had studied biology solely from macroscopic vegetative and animal life would find himself confronted by facts irreconcilable

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with his "laws" were he to investigate the life history of bacteria and protozoa.

These considerations illustrate the care with which we should approach any study of the human organism. While it is quite true that many laws affecting the world exterior to the body affect the latter also, it is indubitable that just as the body has its own form so it has activities either peculiar, or whose modifications are peculiar to itself.

Of necessity any investigation having the character of that now under discussion is intensely technical. It is quite possible however, to so strip the facts of terms not generally understood, and to so present the former that the man and woman of every day education may pass judgment.

Those who have never touched biology practically are inclined to think of the science as if it comprised an aggregation of related and exact data. There are sciences to which this description very accurately applies; but a study of biology shows it to be characterised by variation within limits. That is true of the human body. It has lungs, heart, limbs, and other such parts; it has a like series of linked functions, but in each individual variation obtains. The hackneyed, misunderstood and blunted old word "constitution" applies to each body. It has its own physical characters, within a range of type common to all human bodies.

What I have to set down here must be read in the light of the truths just stated. There would be no need for directing attention to it were I

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writing exclusively for physiologists ; the necessity is patent when one is writing for a less technically instructed public.

The first great fact in human life-history is gestation itself. We may take the most usual period to be 280 days. The length of gestation has an influence on bodily vigour commensurate with existence itself. It is not a thing negligible, or one for any deficiency in which full compensation can subsequently be made. It is the period during which the body-temple is being built; and for thoroughness in its construction full time is needed. Gestation spans the first great stage in life history ; it connotes the complete, or only the partial development of the body. So true is this that—other things being equal—an assurance expert would bank heavily on life expectation of a full-term child as against that of one whose birth was premature.

A child is born. At the end of another period of 280 days it acquires the first developmental change in function. An infant of six or seven months differs from an infant at birth merely in weight and size. But at 280 days its salivary glands gain the power of secreting a ferment which transforms starch into sugar. In the entire life history of the organism no change has more importance. Before its obtainance the digestion of starchy food is a matter of difficulty, for the labour is thrown upon other internal secretions that are unequal to the task.

When a child is born it has in the throat region a well-developed gland, the thymus. That gland is of great physiological importance during in-

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fancy, but of none thereafter. It begins to atrophy at the termination of seven periods of 280 days after birth.

A human being could exist for an ordinary life space in the edentulous state, the function of the teeth being purely mechanical ; but the duration of intra-uterine development, the acquirement of salivary digestive power, and the atrophy of the thymus are of vital importance.

I submit that we are justified in tentatively regarding the day as a minimum life unit, and a period of 280 days as a maximum unit common to the three facts considered, and that this latter unit is a true standard measurement for dealing with human life from the date of conception to the time when the thymus begins to atrophy.

Do these units coincide with the biological truths of later life? The body reaches its full development at a period circulating round, or identical with twenty-five and a half astronomical years. This life span contains from nine thousand to nine thousand, two hundred, and fifty days. Thirty-five units of 280 days agree closely with this ; and may be said to agree exactly with it, if we allow for normal variations.

The menses occur every twenty-eighth day, that is there are ten such functionings in every 280 days. Usually, the "close" days, those during which the condition obtains—number forty in this period, a suggestive number, as it is one seventh, a physiological sabbath.

There is good reason to believe that men pass through a cyclic nervous change which is a variant of the feminine type. However that may

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be, the relation of the feminine function to its subject is one whose importance is not exceeded by any other particular in the woman's life.

It means that a guest-chamber has been dismantled, because the expected guest has not arrived.

In the astronomical sense a lunar month, a day, and a year connote the recurrence of the status quo. A day, and a month also signify a status quo in the human body ; but beyond this there is no law of recurrence. There is nothing cyclic in advancing life history. The decay of senility advances by stages that never tend to anything resembling a previous stage. The term "second childhood" is an inaccurate poetical metaphor. Between the semi-calcified, tissue-poisoned condition of the body in old age, and the body of the babe replete with potentials for attaining to fulness of vigour there is no resemblance.

A "year" in the astronomical sense is not significant of any fact in human biology. The period of 280 days is very significant of all the major biological facts, and we shall be justified in regarding it as a true biological year, understanding always that it measures—not periodicity—but stages to a terminus.

The division of the day into twenty-four hours, and the division of the hour, and of the minute are merely conventions. The dividends do not point to any natural truth.

Is there a possible dividend of the day that has a relation to any vital activity?

Let us examine the pulse rate. Here the

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variability is striking. The pulse of a newly born child may beat at 150 to the minute, while that of an aged man may be only 55 ; but the most frequent rate in the adult is 72. The interval between two pulse beats is less in point of time than that between two seconds of an accurate chronograph. The ratio of second to pulse is represented by  $\frac{60}{72}$ , that is a pulse equals .833 of a second unit.

Now, taking the biological year as 280 days, and the astronomical year roughly as 365 days, the former is .767 of the latter. The difference between the ratios is only .066. Allowing for physiological variations within limit, the quantities so nearly agree as to suggest that the ratio of the pulse to the minute is that of the biological year to the astronomical.

Terms of metaphor are misleading when carelessly applied to things of science ; yet they are so convenient that one is reluctant to discard them. In the phrase—" living at high pressure " much truth is conveyed. The pressure may be not only one of environment, work or pleasuring, there may be a pressure from within of the conscious self, an extreme output of nervous energy, or a hypersensitiveness to environment. High pressure, in the physical sense, will get more work out of a gas or a water supply than will low pressure, but it will exhaust any given supply the sooner. High pressure in the human organism shortens the total life-period. It hastens every intra-bodily activity ; it wears out the body. Changing metaphor for a stricter terminology, we may say that high blood pressure



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connotes the more rapid discharge of all work than does its opposite. Now, this high blood pressure always means a more rapid pulse than the low pressure pulse of health. Often, the difference is only a fraction of a single beat per minute ; but multiplied by sixty, and again by twenty-four, and again by the days of a year—it indicates an additional labour of no slight character.

The initial life unit, that which truly measures existence from birth to death is the heart's beat, or as we may say—the pulse beat. It is this which is ticking off more accurately than any construction of the horologist the true moments of existence. Its speed rate is in inverse ratio to longevity. It is hurrying us through the possible period of our bodily fitness, or dealing out the activities so economically as to give us a fair chance of our attaining to old age.

*To so grip the truth that it may never be forgotten we must regard the entire bodily life from first to last as a sequence of potentials ; a fixed, but unknown quantity. High pressure means rapid exhaustion ; low pressure means slowed exhaustion.*

Hence it is that the biological moments have such a controlling power over the advent of the major bodily changes. We see this in the coming of puberty, the premature manliness, or the prolonged boyishness of the individual. “ Soon ripe, soon rotten ” is a coarse old English folk-saying, true in physiology. These pulse moments make up the year of 280 days, but into the year of one life they may get far more work than into the year of another life. Hence, again, the one man at seventy is old, while another is young.

## CHAPTER XIV

FOR the benefit of the general reader—not of course, for that of the medical practitioner, who is perfectly familiar with such matters—I have to deal for a short space with some factors in health culture that have been of late rather prominent in the public view.

What are called “X rays” are produced by passing a current from an induction coil, or Wimshurst machine, through a tube that has been exhausted of its contained air.

If there be no aerial exhaustion, sparks pass. If the exhaustion is only partial, a luminous column of gas appears. On further exhaustion the luminous column appears stratified, and a dark region is seen near the negative terminal. By carrying the exhaustion still further the tube becomes fluorescent, and faint dark blue streams pass from the negative to the positive terminal. They consist of negatively charged particles with a velocity of thirty-one thousand miles per second. Each particle has a mass equalling about the one thousandth part of a hydrogen atom.

When the exhaustion has been rendered fairly complete the glass about the negative region shines with a yellowish-green light. The term “X rays” is applied to the rays having this character.

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X-ray treatment is not of the remotest general physiological benefit. It has been used with some success for the reduction of enlarged glands, and, very frequently, dermatitis has occurred as a consequence. So has it been with the employment of X rays for the removal of superfluous hair.

It is said on good authority that the tissues are disposed to cancer by the use of the rays. However that may be this much is certain—their employment as health aids is dangerous, and useless. The real utility of the X rays obtains in their application by the skilled medical or surgical practitioner to cases of malignant diseases, or to sub-dermal examinations, as those concerned with the joints and bones.

Sunlight has been lauded as a giver of health and strength, but it is not a thing in which one can indulge without some care. Sunstroke is one possibility. Inflammatory disorders of the eye constitute another. Localised dermatitis is a third. It must never be forgotten that the relation of sun *heat* to the blood, and consequently to the heart, is immediate. To the sun lover it may be said: Protect the head. Shield the eyes. If you find the heat productive of nervous exhaustion, consult your medical man. A tonic, acting both on the nervous centres and the heart may prove of benefit. Of necessity, when the blood supply to the surface is so greatly increased, that of the internal centres is lessened.

The man, or for that matter, the woman, who has sufficient personal interest in the problem

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under consideration to be desirous of making its solution a thing of supreme importance, should, candidly, and very thoroughly undergo either a self-examination, or one at the hands of a medical expert.

It is necessary to insist that the scope of this little book is not that of a medical or surgical encyclopædia. In such a brief space as I have at my disposal I can do little more than supply generally applicable hints. Thus, in a huge percentage of persons over forty years of age the hair, skin, joints, and eyes will show an impairment of their youthful freshness. Rheumatism may be present at a yet earlier age; and at forty, or later, gouty conditions may demand attention. To such impairments of the health may be added very clearly marked diseases that have no connection, immediate or remote, with senile decay.

A man or woman suffering from a dangerous disease of any organ may be totally unfit for undergoing any course of training. When the health allows, one should not only undergo the training, but should make it so thorough that its effects will be felt from the beginning.

The first thing to aim at is activity of the bowels, skin, and kidneys. If this be very thorough, the body will be largely cleansed of its toxins.

The second detail is suppleness of the joints; the third is vigour of the circulation through the smaller vessels. The fourth is activity of the liver. The fifth is the nutrition of the nervous system, as the great governor of all

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vital action. And to this list may be added many things of minor importance, or, if it be preferred, of less vital importance, as the care of the eyes, the teeth, the hair, the skin.

Salines, stewed rhubarb, stewed prunes, and stewed apples can, as a rule, be made to ensure a daily free action of the intestines. That of the skin should be promoted by means that accord with the climate or season. One can scarcely perspire too freely, provided one guards against chilling. Drink plenteously of pure water, and so flush the kidneys. Do *not* go in for attempting to greatly increase muscular size, for no increase in size, as such, will be of the remotest advantage to you. Make the joints supple by using all of them very freely. Even at the age of seventy you should be able to stoop and touch the floor, while keeping the legs rigid. After some days you will be able to touch the floor with the closed fist. Massage the joints thoroughly. Use very vigorous friction, with a bath glove or towel, to the entire body. Work from each foot, over the lower leg, and the thigh to the trunk. Work from each hand, over the arm, to the trunk. Use the towel to the back, diagonally. Then go over the neck region, working towards the chest. Do not forget the axillæ, and finish with friction and gentle kneading of the abdomen.

If any joint, or any muscle is rheumatic, rub that part daily until it glows.

Your aim in all this is to promote a free circulation of the blood, which, in turn, will fight against degenerative changes.

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Do not be misled by advice from those who cannot distinguish between the training suited to the youth who is hoping to win in some athletic struggle, and that which is intended to make an enfeebled body function more thoroughly.

Running, and all other such active forms of sport do not improve the general well-being. They are dangerous to the man of middle life. The glow resulting from exercise is a witness to the improvement in the circulation; but the body is never more liable to become chilled than when over-heated. Chilling may readily occur from the evaporation of the sweat. Therefore, follow any effort that has thrown the skin into a glow by rubbing it with dry towels.

When a muscle works it makes an acid—sarcolactic. This sarcolactic acid is carried into the system, and is destroyed. A muscle that is greatly and quickly reduced in temperature *ceases to give up its acid*. The action of sarcolactic acid on muscle is to stiffen it. That is one form of rheumatism.

Why the ordinary stiffness after exercise?

Because more of this acid has been formed than the muscle can get rid of. The best treatment for stiffness is hot bathing and massage. Training greatly lessens the tendency to stiffness.

If your brain is weary, don't go in for anything demanding skill. It has been proved that the fagged are injured by anything that needs an effort of mind, or of will. They require free

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play for the muscles, without the least care whether the thing they do is—in point of skill—good, bad, or indifferent.

Of course, one's condition, including that of finance, must determine what is practicable. If this allows, the following will be found a good routine, but it may be modified to suit special needs.

Rise at six-thirty. Five minutes exercise. Tepid bath, finishing with cold douches. Thoroughly rub and massage the limbs, and joints. Take a light breakfast, in which fruit, wholemeal bread, and raw greenstuffs are conspicuous. For drink take water, milk, tea, coffee. Note very carefully the effect of any tea or coffee. Quite possibly, it may occasion nervousness, or dyspepsia; if so, strike out from the diet at once. Allow three and a half hours intervals between breakfast and the mid-day meal. If this is a solid meal, with meat, you will not need meat later. In such case let the third meal of the day, taken at, say, six, be rather like your breakfast. Accustom yourself to going to bed supperless; but if this occasions discomfort take a little dry stale wholemeal bread, and stewed fruit, or milk. I do not foresee any deadly injury from a little good claret, or ale. Stout is rather too gaseous for some persons.

## CHAPTER XV

LIVING matter is a product of intra-atomic energy. That is a statement which, although indubitably true, adds nothing to our stock in trade. To speak candidly, the history of practical chemistry has been more amusing than a cross-word puzzle. When self-satisfied professors of chemistry confined their analyses to things inorganic it was deemed that percentages of constituents accounted for everything. So, this belief was brought by the analysts to their investigations in things organic. Here came the first "staggerer," for it was found that percentages accounted for nothing. Thus, two organic compounds might have the same quantities of separable elements, and yet be as unlike as cheese and batter pudding. I have already pointed out that it is impossible to represent the constitution of a complex organic compound by formulæ in straight lines, on one plane. Each molecule is a thing of three dimensions. But in organic chemistry we are dealing very largely with things that are in *Dynamic*, not *static* equilibrium.

It is my wish to put the truth so simply that the unlearned reader—equally with the technical expert—can grasp it. Truly indeed, does that great chemist, Le Bon, say that we do not know how the simplest cell acts as a laboratory, but that it does so act is indubitable.



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Between any metal as it is found on the bench, and as it obtains in the living body there is a striking difference. The careful analysis of an organic substance may, for example, give so much iron, and we may conclude that it will be an easy task to synthesise the compound of which it forms part ; but any attempt at this will prove us wrong. Something in the natural compound is absent from our synthesis. There is a seeming mystery here.

We take the metallic compound, as obtained by analysis, and by using an electric current to a solution of it find that a percentage is obtainable in a form that has properties totally unlike the bulk of the metal—as we have extracted it. To condense a volume into a sentence : the metal obtains in the living tissue in what is called a colloid form, and this is totally dissimilar from anything producible outside the organic world.

What is true of the metal is, in all probability, true of all other elements. And, to take advantage of that fact, if we wish to feed the tissues with any element it is best to do so by giving organic food containing such element.

Radio-activity is a property of all substances. Some rays are visible, while others are demonstrable by their affecting photographic plates. Radium itself has no beneficial action on living tissue. It is one of those things whose history reads like a page from a romance.

It had been known for long that many substances, such as calcium sulphide, barium sulphide, and zinc sulphide became "phos-

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phorescent" after exposure to sunlight. Crookes proved that uranium salts had a similar property. Madame Curie discovered that the minerals known as chalcocite, and pitchblende were more active than any yet dealt with. The chief source of both is Cornwall. Pitchblende resembles old dry pitch in character. Chemically, it showed itself to be oxide of uranium. Chalcocite is a brittle, green mineral. It contains copper, phosphorus, uranium, etc.

Madame Curie went to work with the courage of a heroine, and the faith of a saint. The history of her labours has the charm of a romance. She began by fusing with sodium carbonate, dissolving the product in hydrochloric acid, and then removing metals, as lead, copper, and bismuth by precipitation with hydrogen-sulphide. Ultimately, she isolated a radio-active element in combination with bismuth and sulphur. This she called "polonium." From this polonium she obtained, by fractional distillation—*Radium chloride*. This glows in the dark with a faint luminosity. One ton of ore yields only a few grains of radium. It has never yet been obtained in the metallic state. The emanation of radium gives rise to a gas, named helium.

Hundreds of experiments have been tried with radio-active materials without affecting living tissues beneficially. It is just possible that the presence of radium in certain waters of western England may account in a measure for their therapeutic power; but it is unquestionable that no salt of radium by itself has ever proved of any utility whatever in surgery, medicine, or

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physiological experiments. It is one of the things to avoid.

I am desirous of bringing my little book to an end, but I cannot do so at the moment, for again I have forced on my attention one of those many appeals that all workers in health subjects receive. It runs: "I am a vigorously healthy man of sixty-five, but absurdly stout. I know three men who are equally ill-favoured. What can we do?"

My dear reader, you and your friends must give the matter that very personal character you would accord to anything else, and so each must ask himself: "Why am I stout?"

Some people accumulate fat under conditions of diet that leave others normal. The causes have to do with the chemistry of the body.

Modern science is not able to abolish these causes. All it can do is to prevent their effects being so marked as would be the case if they were let alone.

The aid most commonly sought by the stout is medicinal. There are two drugs in wide use which undoubtedly have the power of reducing fat. One is thyroid extract; the other is an extract of the seaweed known popularly as bladder-wrack, and to botanists and pharmacists as the "fucus vesiculosus."

To take either of these drugs effectively, and at the same time with perfect safety, one must watch their action carefully, and modify the dose, or withdraw the drug, if the symptoms demand it.

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To treat stoutness by dieting is less risky, but even this has to be very carefully managed. When a person has been used to a plenteous dietary, a reduction to the fasting point is cruelty, and prolonged treatment of this kind is nothing but living martyrdom. It is far wiser to make the chief difference one of quality; that is, to put aside those foods that most readily form fat, and substitute others.

People who wish to reduce stoutness should not take the fat of meat, salmon, pork, butter, cocoa, chocolate, untoasted bread, pastry, tapioca, sago, potatoes, rice, maize, beet, oily salads, stout, sweet wines, or sugar.

They may take: greenstuffs, tomatoes, onions, garden currants, lean of meat in moderation, cod-fish, stale toasted bread, and tea or coffee, sweetened with saccharin. Any drink should precede or follow the meal. Franz Josef mineral water is excellent for its aperient action.

Water does not make fat, but it enters largely into the composition of the other tissues, and so may appreciably add to the body size and weight. It does this most effectively when it is mixed with the food, as when taken during a meal; also when taken in sips at any other time. When liquid is taken in quantity, the stomach being empty, a great part of it is excreted rapidly.

The successful and safe treatment of stoutness depends very largely on the state of the heart. Whatever the heart's condition, such a diet as that advised cannot work harm.

It is far otherwise when we consider two other

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aids—forced sweating, and exercise. When one has had the heart examined, and is sure of its soundness, there is good sense in carrying out what some trainers call “blanket sweating.” This means that the stout person is made to sleep beneath piled bed-clothing until the body perspires profusely. This is followed by a brisk rubbing down with a liberal supply of towels.

Of all possible helps in the reduction of stoutness nothing even approaches exercise—*when* it is practicable. In many cases it is not so, for activity is prevented by the great weight of the body. Neither is it practicable when the heart is weak. Still, there are countless cases in which it is the one thing desirable. The mild stroll is of no use at all; the exercise must be brisk, making the body glow and sweat.

Scanty drinking, free sweating, modified diet and exercise are the four means used by the physical culturist. To these one may add massage.

In dealing with a subject that approaches the illimitable in extent, while one's space is of the opposite character, the choice is between writing succinctly, that is, synoptically, of many details, or more discursively of a few. I have, in this booklet, followed the latter plan.

There are, I know, scores of questions pertinent to the subject under discussion which a critic will be inclined to ask. A few of these I may, perhaps, be allowed to anticipate.

A campaign directed against the great enemy of physical life should begin, when possible, by ensuring that the babe shall come well nour-

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ished and well formed into the world, shall be trained into a physically sound man or woman, and shall then be dealt with as having to resist all those processes, chemical and other, which we know to be degenerative. Very obviously, treatment will be largely governed by the period of life at which it is begun. This applies more especially to what is styled "physical culture." To advise the man or woman of the sixth or seventh decade to indulge in vigorous athletics or cold-bathing, when neither has entered into the daily life, is to risk being responsible for serious and even fatal injury.

The middle-aged, and the old, when taking up this matter of health culture, should avoid all fads, that is, theories and procedures that are not in harmony with positively proved facts. One such is over-purgation. Regularity of function must be sought, and gained; but when recourse is had to salines and other purgatives with such freedom that a condition not markedly different from chronic intestinal catarrh is established, the harm far outweighs the benefit.

I have already mentioned that one fad introduced some years ago by a well-known surgeon bore the descriptive title: "Physical Jerks." It was an example of what *not* to do, for it worked positive mischief. In the later decades of life whatever has the character of jerking must be productive of injury. Under any such sudden strain the walls of the blood-vessels may yield at some weakened spot; the abdominal walls also. In the former case an aneurism results; in the latter a hernia.

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### PSYCHO-ANALYSIS

All the complicated emotions, passions, and other phases of consciousness that have to do with things of this life are derived from the experience that begins with the first moment of free life, after birth.

We see, hear, taste, smell and touch ; and we straightway forget. But the facts are registered in the mind. This mind has, theoretically, two "layers." The one is the upper, the memorised, made up of what we *know*. Between this layer and the lower is a line, limit, or division—the "limen," and in the mind below the "limen" the forgotten experiences are stored. But just as the consciously held facts of the super-liminal mind may be used, and elaborated, so may those of the sub-liminal mind; and, at some moment, they may pass to the super-liminal part of the mind, and so become *Known*.

If you dissect your body, you cannot be surprised when the dissected parts fail to perform their functions. If you dissect your mind you can never put it together again. You will be consciously unnatural.

Self-analysis is as unwholesome on the mental plane as imagination directed to the digestion of one's dinner is on the plane physical.

Professors of anatomy, like other members of the great social family, enjoy a good dinner. When dining, they do not bring anatomical facts to the foreground of their mind, and trace mentally the structures through which the in-

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gested food passes, and the digestive changes wrought in it.

The trend of fashion in the psychology of to-day is to bring the entire consciousness under the scalpel. That would be harmless if the teaching had no reference to the self, if teacher and student were detached from it; but it is otherwise. The student, whether adult or child, is taught to place his emotions, and their causation under a mental microscope. He is taught to be a machine, volitionally carrying out the functions that his myriad ancestors have performed unvolitionally. Nothing is to be left to the secret working of the forces and conditions that have come down to him through the generations. He is to press a mental button, and see the figure work.

Just as Nature has initiated, and carried on a bodily laboratory wherein are produced secretions for the maintenance of metabolic activities, and has done this "carrying on" through countless thousands of years, wherein man knew nothing of his anatomy, or physiological functions, so she, the great mother, has constituted each man mentally a delicately adjusted and sensitive machine for reacting to environment; and any attempt to recreate the human intelligence in terms of the professor of psychology, must be as faulty as a physical human body would be if its cellular activities were limited to our present range of physiological facts.

In this mental probing there is a possible danger on which I have not touched. All mundane consciousness is on the physical plane;



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but the veil between its deeps and the astral plane *can be broken through*. He who *does* break through must pay the price of his trespass.

The whole aim of mental training should be the cultivation of strong common sense, self-confidence, and freedom from all bashfulness, timidity, and nervousness. Morbidity should be regarded as a foul pestilence.

There are some people who pull down the blind, light a candle, and then, groping amid the shadows by its feeble glimmer, think that they have discovered wonderful truths.

It must be clearly understood that all the procedures recommended by genuine experts in hygiene, dietetics, and physical culture are put forward without false pretence as having but one objective, the attainment and retention of good health. No claim is made for them that they will extend a life beyond the normal duration, or, in other words, that they will conquer senile decay.

Medicine itself is equally modest, and honest. It does not claim for any drug, or combination of drugs the powers of an elixir. If any such claim is made at all it is by the advocates of sexual hormone surgery; but in this regard it may be said emphatically that while ample evidence has been adduced to show many cases of improved vigour resulting from such measures, not a scintilla of evidence has been offered as to the genuine restoration of his or her youth to an aged person.

Many years of quiet physiological work, and

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careful noting of the effects wrought by various methods, and various drugs have convinced me that in pharmacology, dietetics, hygiene, physical culture, and electricity, we have agents capable of producing results that very nearly approach to rejuvenation. Amongst such drugs are glycerophosphoric acid, strychnine, arsenic, and nitrohydrochloric acid, with, of course, certain of the endocrine preparations.

Iodine also, and occasionally a little phosphorised oil, preferably in pill form will be found of service.

Dosology is determinable by individuality, just as the "dosology" of exercise and diet must be determined.

The galvanic current is the form of electricity I advocate; and very certainly we cannot afford to ignore that mighty factor in all life—the light of the sun. This detail is in itself a subject too wide by far to be dealt with at the far end of a booklet.

All such aids are best adopted under the direct advice and personal supervision of a medical practitioner who is learned in the subject.

I have in simple language indicated the outlines of a wide and deep study. If these outlines covered the entire field of our possible conquests, scanty indeed would be our reward. It can be of no interest to the condemned criminal to see the way in which the scaffold for his execution is erected. Things are not nearly so bad as this, for the knowledge of what Time does, and how

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he does it brings us to the point where we try to counter these harmful attacks by all the resources at our command. If it were not for that knowledge we should be struggling blindly and ineffectively. But we know quite well what to attempt. That, at present, our resources are unequal to our requirements is regrettable, but has nothing of finality.

FINIS

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HORNIBROOK, F. A. "The Culture of the Abdomen."  
6s. net.

There is one book that I can confidently commend to the notice of all those who wish to reduce stoutness, or to remedy habitual constipation.

The work has been amply illustrated, and the illustrations are good in themselves, and helpful to the reader. The letterpress is as plain as English can make it. From beginning to end the advice given is easy to follow, and never once does it clash with facts physiological.

The author has produced such an excellent little work that it should be in every library, and in the hands of all those who are interested in the subject of physical culture.

HORNIBROOK, E. A. "Wholemeal with Practical Recipes."  
1s. 6d. net.

Those whose interest is centred in the whole-meal *versus* white-meal controversy should obtain a little work that deals with this matter exclusively. The authoress, Mrs. E. A. Hornibrook, is absolutely fair in her statements. She shows that the production of faulty whole-meal is the chief reason for some brands of this kind of bread failing to give satisfaction. Many recipes are furnished, and will be found practically useful. One section of the book, dealing with the utility of spices may obviate, in some cases, the taking of less pleasant medicines..

COBB, IVO GEIKIE, M.D. "The Glands of Destiny."  
7s. 6d. net.

I am not an advocate of the sex-gland treatment, but there is no shutting one's eyes to the fact that endocrinology is the most important development of physiology that the last half-century has produced. Those who wish to study the influence in the system of the various endocrine

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secretions will find a fund of information in this work. A great part of the book deals with facts that have been proved ; and some part is speculative ; but the author is always frank and honest when advancing opinions, and probabilities. It is an interesting work ; the sort of work that asks to be read more than once, and that rewards the reader for his trouble.

SCHMIDT, PETER, M.D. "The Theory and Practice of the Steinach Operation." 7s. 6d. net.

In the foregoing pages I have mentioned the Steinach operation. Those who wish to go more fully into the subject cannot do better than obtain this work. It has an introduction written by Dr. J. Johnson Abraham, and this of itself is worth studying, for it gives succinctly a history of Steinach's procedure.

LANE, Sir WILLIAM ARBUTHNOT, Bart., C.B. "Secrets of Good Health." 3s. 6d. net.

The general reader, unfamiliar with the leading facts of hygiene and dietetics, cannot do better than purchase this book.

The author's science is thoroughly sound ; it is free from all fads. He chooses simple language, when that is possible. He takes the reader over all the chief exigencies of daily life, and the advice given is always practical, calculated to attain the end desired, and so expressed that it cannot possibly give offence. Of its kind, it is an ideal work. It reads with the simplicity, and the verity of a Gospel.

All the foregoing books are published by Messrs. William Heinemann (Medical Books), Ltd.

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