

## **Our brain, body and nerves / by Andrew Wilson.**

### **Contributors**

Wilson, Andrew.

### **Publication/Creation**

London : Cassell, 1911.

### **Persistent URL**

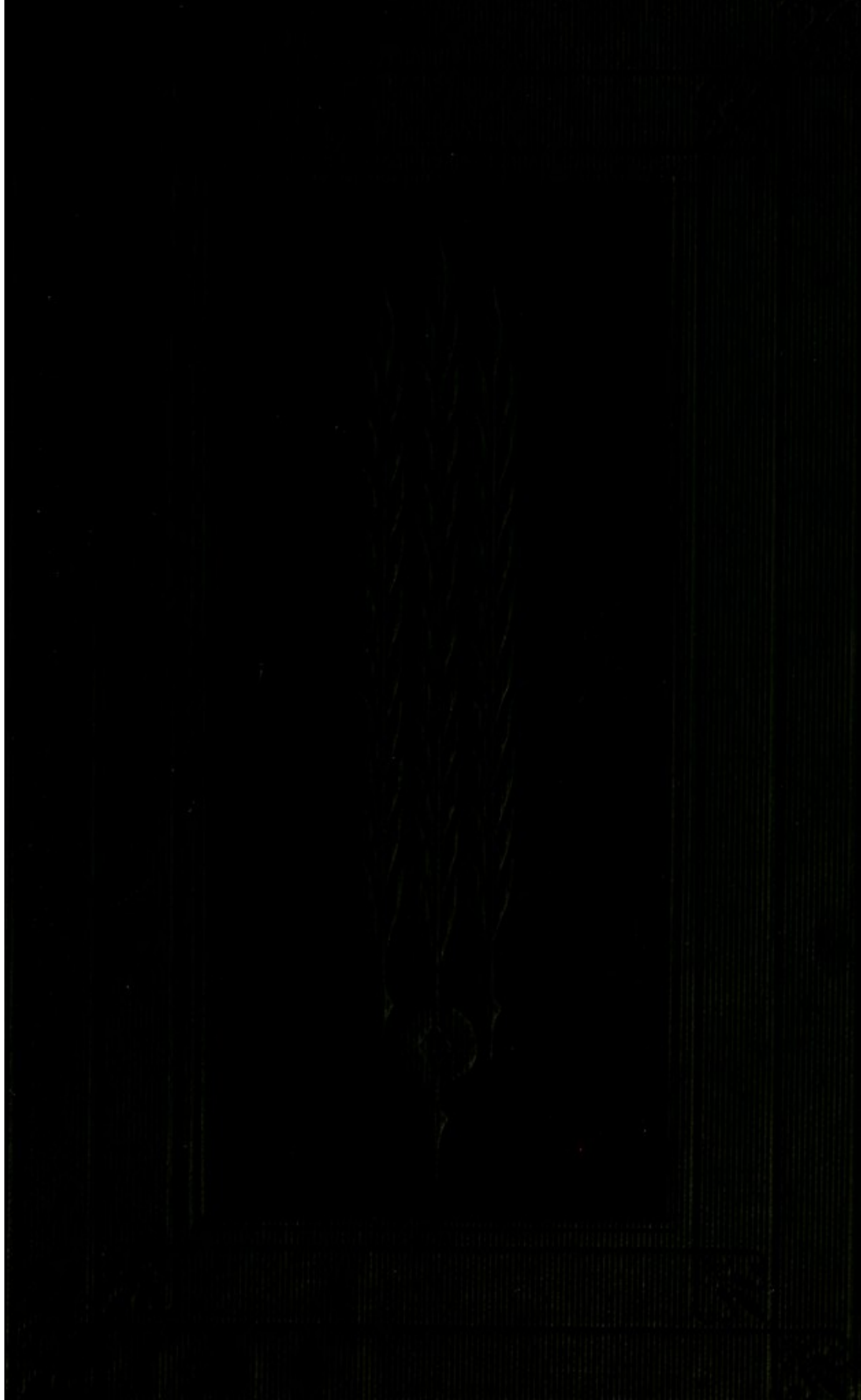
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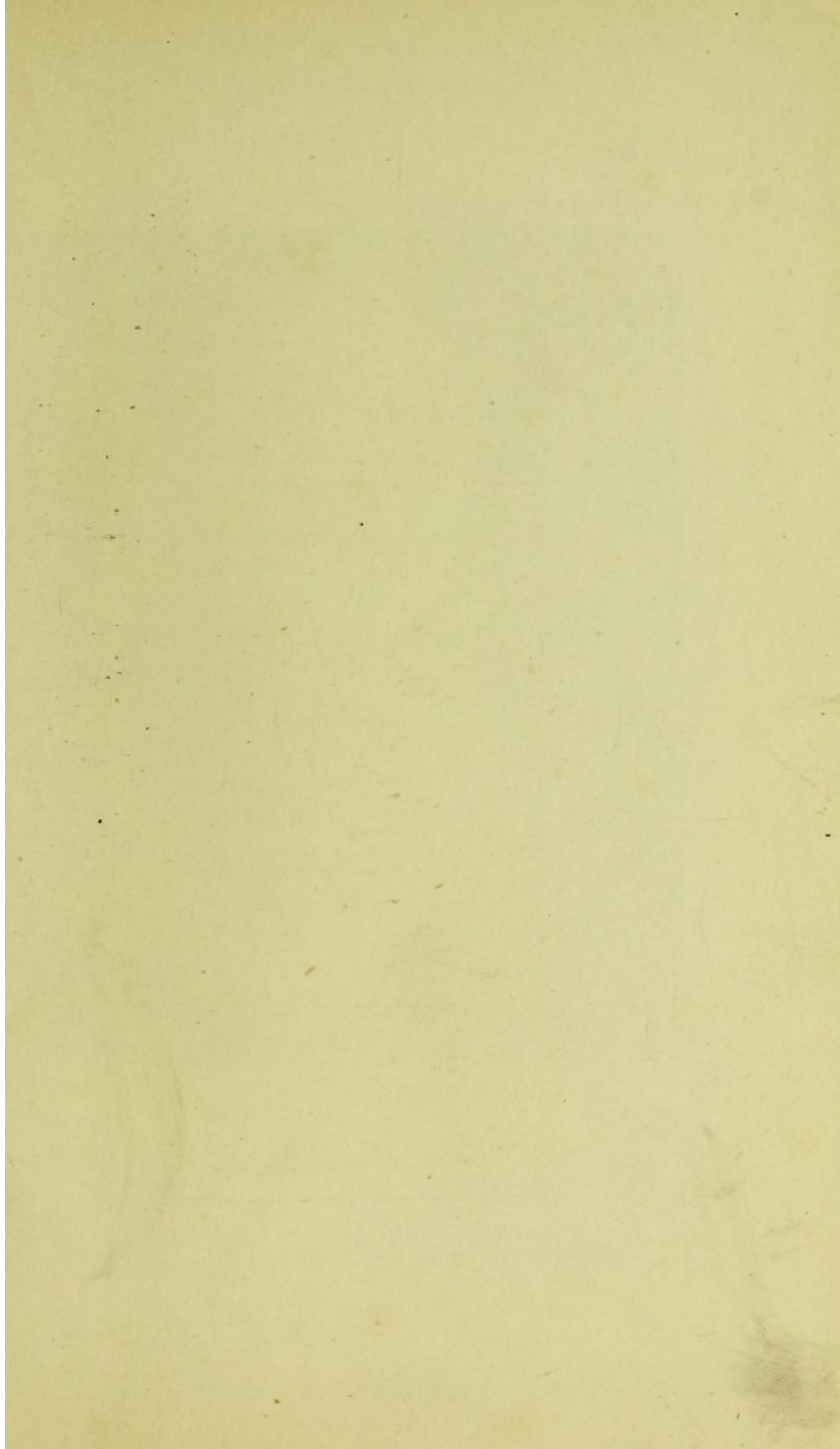
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Our Brain, Body and Nerves

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DR. ANDREW WILSON

OUR BRAIN, BODY  
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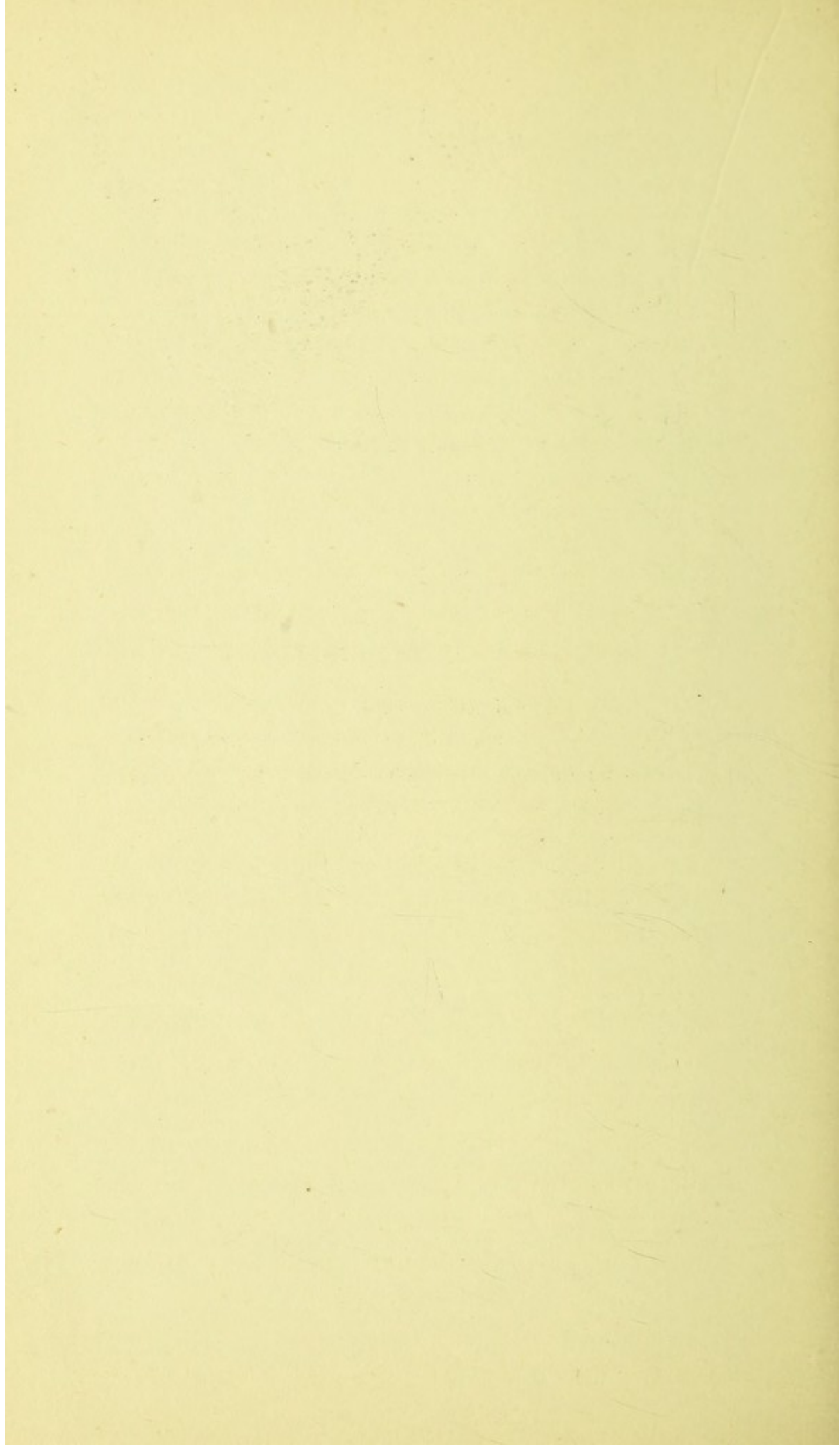
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# OUR BRAIN, BODY, AND NERVES

## CHAPTER I

### THE BASHFUL MAN

**I**N the days of my youth I remember reading a story entitled "The Bashful Man." It appeared in a certain ancient "Commonplace Book" belonging to my worthy mother. Where this volume had come from, or how it found its way into my mother's library, nobody could tell, but there it was, and a source of infinite amusement and instruction hand in hand, as the saying goes, it passed to me. Among the lighter tit-bits which the editor of the book had collated was the "Bashful Man" story. I do not suppose that what amuses one in the days of one's youth exercises an equal effect in the days of one's age. The old gentleman who sits in the stalls and tells you (in a loud voice which can be heard half over the theatre) that "Pantomimes, sir, are not what they were in my



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young days ! ” represents the *laudator temporis acti* principle, and we are really all of this sage’s way of thinking when we attain to his years. It is not so much that our life’s pantomimes have changed, but that we ourselves have altered and see things from a very different point of view. It is so with commonplace books and other literary treasures of the days of our youth. What we then regarded as masterpieces, we now condemn as puerilities, and the “ Bashful Man ” story, I suppose, would present no exception to the rule, if one had the opportunity of reperusing it to-day.

It was the tale of a certain young baronet afflicted with the mental ailment which gave the story its title. He committed the most terrible solecisms, and plunged into the most ludicrous mistakes by reason of his failing. I cannot remember one-half of his troubles, but I recollect the culminating point of the story with which, I think, the author wisely ended his chronicle. The baronet, going out to dinner, had upset an inkstand in the drawing-room of his host. Anxious to repair his error, he had mopped up the fluid with his handkerchief amid the protests of his hostess. Later on, dinner was announced, and the

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baronet, proceeding to the table, was flurried as usual by the polite and simple conversation of the lady he had escorted to the table. Blushing violently, he had recourse to his handkerchief and wiped his face with the ink-stained rag. This, of course, caused a *contre-temps*. Everybody roared with laughter at the nigger-like physiognomy which the baronet exhibited. I believe in his agitation he upset his soup into his fair neighbour's lap, and rushed from the room in a state of perturbation which might be better imagined than described.

Such was the tale of the bashful baronet. The story has its moral, of course, and that moral is the very awkward nature of the failing which we may describe as bashfulness, nervousness, or want of the due and proper control of one's emotions and feelings. In truth it is by no means the light thing that non-sufferers suppose. As in the case of other ailments, we are all philosophers who could "bear even the toothache patiently" when we do not suffer ourselves. It is easy to play the part of Job's friends and relations, but not so easy to enact the *rôle* of the afflicted patriarch. This everybody admits, and it is so in the case

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of that modern ailment which we may describe as the nervousness that afflicts a very large proportion of us in respect of the affairs of society and of everyday life at large. It cannot be denied that the age we live in is one that makes very considerable demands on all our bodily systems, but on no one part of our organization is the strain greater than upon our nervous apparatus. Life proceeds very quickly indeed in these latter days. The fifty years of Europe which the poet prefers to "the cycle of Cathay" represent a tremendous expenditure of energy such as cannot fail to leave marked traces of its effects on the race that hurries through its evolution at breakneck speed. If we are told to-day that the pace we live at makes tremendous demands upon our digestions, our hearts, and even our kidneys, it must affect in still more direct fashion our brain-cells, and the apparatus over the destinies of which they preside. Hence arise the common nervous ailments that affect us. It is not a question this of absolute illness, but rather one of "little health." We are not exactly ill, and we are not precisely well. We are reducing the mortality from former epidemics at a satis-

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factory rate. Cholera has been essentially abolished as a British complaint, and it is to be hoped one day typhoid fever and other infectious disorders will be similarly reduced to a miserable minimum, even if they are not altogether annihilated from the list of ills to which flesh is heir. It is different with other ailments, or rather I should say physical worries. They are incidental to the existence we pursue. They crop up in disorders of digestion, in the increase of gout, and above all in the development of nervous disorders that range from sleeplessness and general irritability to brain troubles of graver kind.

This is not a surprising result, I contend. Our brain-cells to-day are doing ten times the work of those which belonged to our forefathers, and as a result they rebel the sooner and the more frequently against the strain to which they are subjected. The busy man or woman to-day is essentially a "neurotic" subject. I do not mean to imply that we are invalids, or even that we are incapacitated from duty, but we are certainly as a race more subject to nervous ills than were our parents, and the life of to-day has nothing at all in common with the slow, peaceful existence led

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by our grandparents. If any one proof of this truth be demanded, I think we find it in the inexorable demand for holidays which is everywhere represented. Our Cooks and Lunns find their business growing and increasing year by year because mankind is recognising that a period of relaxation (I will not call it exactly rest) is an absolutely necessary condition in the art of living successfully. The statutory holiday has appeared in obedience to a natural demand for the unbending of the bow. The strain of life is so great, and the competition in the struggle for existence so severe, that we recognise the need for a period when we may recuperate ourselves for the work that awaits our hands and brains.

Recognising, then, this expenditure of nervous energy which is inseparable from modern life with all its demands upon us, the further question arises how we may best and most easily avoid the evils I have indicated. Evils they are, in the sense that they tend to wear us out before the due season arrives for our retirement from the mimic stage on which we have played our life-part. There will be found no panacea for the modern disease of nervousness, and for the irritabilities it carries

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in its train. This is not a matter of medicine so much as one of ordering aright our daily life in all its respects and phases. It is a matter of hygiene as distinguished from physic ; one of prevention rather than one of cure.

It is well to make this point clear at the outset of our discussion. For this is a pill-swallowing age and a potion-loving generation. Witness the fortunes which are still being made by the vendors of patent medicines, and think how the British public are still willing to be deceived by the Government stamp on the box of pills that is merely a guarantee not that Government approves of the medicine, but that the legislature approves of the medicine-maker paying a tax on the wares he vends, which tax, of course, is really paid by the public themselves. I have before me a list of ailments which Dr Somebody's pills are said to be capable of curing. That list is instructive, if it is anything but flattering to our common sense in respect of the demands it makes on the ignorance and credulity of the nation. Diseases varying from locomotor ataxy (a serious ailment involving the spinal cord) to scrofula and consumption are stated to be curable by a course of the pills. Even cancer

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is suggested as being within the range of their practical utility, and of course a host of minor ailments are included in the list of troubles certain of cure if only the pills are faithfully digested. Among the phases of the nervous system which have not altered in the worry of modern life a crude faith in the panacea appears prominent enough, and it is therefore necessary to divest our minds, once and for all, of the idea that any medicine can cure nervousness or any of the other brain troubles incidental to the rush of modern existence. Lady Macbeth's inquiry of the physician, regarding the ministering to a mind diseased, might be answered to-day by saying that the real remedy would be found in a change of air and other conditions of a healthful environment, but it is certain pills won't, and potions can't, relieve the nervous strain. Even in an asylum for the insane, I think I am correct in stating, there is very little medicine prescribed. The cure is largely dependent on healthful employment of mind and body, and above all on the regulation of the diet, on fresh air, and on all the other conditions which hygiene teaches us are necessary for the preservation of our common health.

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I need not remark that the modern quack has not neglected the nervous system in his attack on the British purse. His pills are warranted to cure nervous ills, although their composition may reveal them to consist of nothing more ethereal than aloes and gamboge, or rhubarb or other everyday purgatives. He has been quick to see that our "little health" is largely a matter of "nerves," and if his pills will correct digestive disorders, or cure consumption, there is no adequate reason why they should not also be regarded as capable of curing anything in the way of nervous ailments from St Vitus' dance or epilepsy, to insanity itself. Even blushing has not escaped the watchful eye of the quack. I have before me advertisements in which the bashful man is advised to apply to Professor This or That (they are all "professors" nowadays who practise palmistry, phrenology, hair-cutting, dancing and other arts), that he may be cured of his little failing. And I happen to know that a very considerable revenue is derived from the specious appeal to a form of nervous action that appears to be specially distressing to the subjects thereof. Herein lies much folly. Blushing is not a disease, as we shall hereafter



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note. It is merely a sign and symptom of a certain perfectly natural nervous action or habit which has for its aim and end the expression of an emotion. It can be kept under control, or inhibited, as physiologists say, and the power to regulate it is largely a matter of education of the nervous system. To attempt to cure blushing by means of medicine would be as irrational a proceeding as to attempt to cure reflex crying in an infant, or to check the natural action of the skin. All three are physiological actions characteristic of health, or are, at least, associated with the healthy state, and therefore lie beyond the province of medicine altogether. They are matters of hygiene not of physic, as I have said.

If we have now defined our position accurately, we may the more profitably enter upon our study of the part played by the nervous system in social life. That system itself represents the mechanism whereby social life is rendered possible, and it is not surprising that we find it easy to divide its action conveniently into those which represent respectively its highways and its byways. We think, we act, and we carry out all the actions on which the maintenance of life depends through

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the action of our nervous system. This is the actual *rôle* of our nervous apparatus. Allied to these nervous actions, and part and parcel of them, we find others which lie less distinctly in the beaten track of nerve-duty. Thus the expression of anger, grief, joy, and of the whole gamut of the emotions and passions illustrate actions which the nervous system initiates and carries out as phases of our lives, and each of these actions involves as distinct and special a physiology as, say, the regulation of the heart or the mechanisms of the lungs. It is among the second class of nerve acts that we find the modern nervous trials of the race to be classified, and this double feature of the nervous system and its work is one which we shall find reflected in its constitution and also in its mode of action.

There is but one way in which we may study the nervous system from the social standpoint, and that is from the physiological point of view. By this is meant that before we can profitably understand the erratic actions of the system, we must understand its natural mode of performing its work. The watchmaker cannot minister to the wants of a disordered timepiece unless he understands

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the construction of the normal watch. The engineer who has not served an apprenticeship in the work of constructing an engine, cannot be expected to repair his locomotive intelligently when it has got out of order. It is so with the body. All true and scientific medicine is founded on physiology. The physician must know the routine work of the healthy body before he can minister to its needs when disease attacks it. What would be thought of a medical man who, professing his ignorance of the meaning of the sounds of the heart, presumed to treat a case of heart trouble? or what would be the opinion we entertained of a physician who, not knowing the part played by sugar in the living economy, proceeded to deal with diabetes? This is the real difference between scientific medicine and quackery, and the pity of it all is that the public do not appreciate the distinction. The educated physician knows what he is doing; he can give reasons for his practice, because he knows that his science supplies him with the knowledge of the body in health that is the foundation of all theories of disease treatment. The quack, on the other hand, is working in the dark. He reasons—if, indeed,

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he reasons at all—from pure empiricism when his practice is not founded simply on nonsense, absurdity, or actual fraud. The physician is like the man who fires at a target with a saloon pistol. He intends to hit the bull's eye, and aims for it with intelligent intent. The quack is the man with the machine gun, who rains bullets at the target in hope that some of them will hit the mark.

Hence it is necessary that we should first of all study the natural ways and works of the nervous system as a foundation for acquiring the knowledge of what that system may be responsible for in the way of affecting our social life and prospects. To the study of our nervous machinery I therefore now invite my readers, assuring them of a ramble in scientific pastures which may chance to be found interesting as well as profitable in the extreme.

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## CHAPTER II

### THE NERVOUS SYSTEM AND SOME OF ITS WAYS

**A**NY nervous system brings its possessor into relation with the world in which that possessor lives. This is a plain but perfectly correct notion of what a nervous system does. No matter whether the animal is a low or a high one, my definition applies. It exercises the function of "relation," to put the matter tersely, because it "relates" the animal to its surroundings. Plants are not known to possess nerves, and in this they resemble the lowest animals, but they possess what is equal to nerves, namely, living matter (or protoplasm), and this matter is always sensitive. In fact, sensitiveness is a constant condition of living matter everywhere. It is this sensitiveness which marks off living things from those which are non-living. The humblest living thing can and does establish certain relations with its surroundings, while no inanimate object shows

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any such relationship at all. Many plants exhibit ordinary sensitiveness to stimuli, a phase of their life seen, for example, when they close their petals on a cold day and open them under the influence of the returning heat of the sun, while some exhibit sensitiveness to a much higher degree. The sensitive plants droop their leaves on the slightest touch, and the Venus Fly-trap and Sundews capture insects by means of the extreme sensitiveness to touch wherewith their leaves have been endowed. There are no nervous elements traceable in such plants, it is true, but then living matter at large has evolved properties and qualities which practically represent a certain development of the nervous faculty.

The lowest animals, similarly, as I have said, exercise their nervous powers by aid of their living matter. In them no nerves are discoverable. They are masses of sensitive protoplasm, and as such act and react on their surroundings. Higher up in the scale we find the living matter evolving a special apparatus which we call the nervous system. Possibly a nerve is nothing more or less than a part of an animal's body that has developed more sensitive properties than the living matter

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around it. We might very well conceive of the evolution of nerves as, I think, Herbert Spencer has suggested. Just as a little rill of water tends to make a definite channel for itself in the sand, and as its flow deepens the channel, so sensitive impulses in an animal originally diffused all over its body may have taken special lines, due to more frequent stimulation of these parts, and thus the frequency of the repetition of the impulses would "deepen the channel," or, in other words, make a nerve-track. Be that as it may, we find in all animals above the very lowest a nerve system.

The jelly-fishes are possibly the lowest forms in which definite nerve-elements appear, and when we proceed from such humble forms upwards, we are able to trace the plans on which the evolution of the nervous system proceeds. That plan consists essentially in the concentration of the nerve-elements in masses. The higher we go in the scale, the more concentrated do these masses become, and the relative size of certain of the masses increases as we advance. If there is one feature characteristic of high life in this respect it is the possession of a head, and that fact

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implies the aggregation of the nerve-elements in the head. This idea represents really a great principle in the evolution of living beings. An animal with a head has got on better in the world than one which lacks that distinctive feature. An oyster or a mussel is confessedly a lower animal than a cuttle-fish, a snail, or a whelk, because it lacks a head; and if we examine the nervous system in the two cases, we may find that while in the oyster the nervous elements are scattered through the body, in the snail or whelk they are much concentrated, and are chiefly found located in the head. If we apply this principle to higher life, we may find it to hold good in the explanation of even man's superiority. For there is no denying the importance of the head, not in man alone, but in all his neighbour vertebrate (or backboned) animals. Within the head is the great brain-mass that rules his destinies and controls his affairs. As man's brain-mass is relatively heavier in proportion to his body weight than that of all other animals (a few small birds, I believe, excepted), we can see how this concentration of the nervous apparatus implies a material advance in any animal's evolution and prospects. We



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see much the same principle illustrated in lower classes. One insect is higher than another because its nervous system is more concentrated at large, and especially in the head region. The spider is similarly a higher form than the insect, because of a similar tendency on the part of its nervous system to exhibit a massing together as opposed to a kind of democratic equality and equal distribution of the system throughout the frame.

The nervous apparatus of man includes two distinct systems. There is, first, the brain system, appropriately enough so called, because the brain is its principal feature, and there is, second, the "sympathetic" nervous system. The schoolboy learns that the brain and the spinal cord (which last is a continuation of the main nervous axis through the body) are protected within the spinal column or backbone, and that from the brain and cord nerves are given off to supply the body at large. But many of us are ignorant that we possess a second nervous system in the shape of the "sympathetic"—this name, by the way, being an old term for it, and one which has been retained without involving any definite meaning as regards the duties it

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performs. The sympathetic system, which, by the way, is involved in certain important functions connected with the display of certain of our emotions, is not contained within the skull and spine, but lies inside the body, and consists of a double chain of nerves and nerve-knots (or ganglia) running down the front of the backbone. This "sympathetic" is connected with its neighbour system, as we shall hereafter note, but essentially it represents a distinct nervous apparatus executing functions that lie apart from the work of the brain and spinal cord.

The meaning of this double nervous furnishing—found, I may remark, in all vertebrated animals—is not difficult to explain, and involves a very interesting little discussion on the manner in which the affairs of our complex life are regulated. When we have regard to the manner in which our manifold actions are controlled, a little reflection will enable us to come to the conclusion that for many of these actions we cannot hold ourselves to be intelligently responsible. This appears to be a strange and anomalous statement, but it is, nevertheless, perfectly true. I may go further, and assert that for the major part of the acts

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on which the very maintenance of our life depends, we are not responsible at all. In other words, the larger part of our bodily affairs is managed, not *by* us, but *for* us. Let us submit this assertion to the proof. The proper and regular action of our heart is admittedly an action necessary for the perfect health of the body. How much, may I ask, does any person in health concern himself with the affairs of that important organ? Nothing at all, must be the reply. We take no heed whatever of the heart's work. It performs its arduous task of circulating blood through our frames, and of providing thus for the nutrition of every microscopic cell of our bodies, without receiving the slightest thought from us. Hour by hour it contracts and expands, and its valves act in regulating the blood-flow, all outside our comprehension. If any one fact regarding the regulation of our bodily affairs is clear to us at all, it must be that which teaches us that the control of the heart's work is not dependent upon our attention and our will. I should go the length of saying that the heart's affairs are all the better controlled and managed because they are independent of our personal attention. Indeed,

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when that attention is directed to the heart, the result is usually to upset its gravity. Violent emotion will cause its work to be irregularly performed ; fright will quicken its beat, while grief will slow it ; and it is evident, therefore, that the emotional influence of the brain is not a thing which can redound to the welfare of the central organ of the circulation. Now, it is the sympathetic system which is charged with the heart's control. When left to itself it exercises that control in a perfect manner. It resembles a State department under the charge of a responsible official, but nominally subject to the supervision of the head of affairs. When interference happens from the head there are "ructions in the office," and it is only when the routine work is allowed to go on smoothly day by day that peace and good-will reign supreme.

The heart is not the only organ regulated automatically. It is true that we can stop breathing (for a time only) at will, but the normal regular rise and fall of the chest is an action that concerns our intelligence and volition no more directly than does the work of the heart. The idea of departmental work is as typically represented in the work of the

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lungs as in that of the heart. Emotion may make us gasp and produce irregularities in the breathing process, but the regular work of the lungs lies practically outside our control, and is all the better discharged because we have no occasion to think about it in health at all. The great process of digestion, complex and involving multifarious details, from the chewing of food and the secretion of bile, gastric juice, and sweetbread juice, onwards to the movements of stomach and intestines, and the absorption of the food, is similarly carried on outside our personal knowledge and attention. Practically, from the moment when food enters our mouth we heed it not. Our chief concern, perhaps, has been in obtaining our bread and cheese. Once we have earned our bread, its conversion into ourselves is managed for us. The work of the salivary glands of the mouth, of the stomach, and of the liver and intestine, is all controlled by the sympathetic system, which in its own way illustrates perfectly the automatic control of our body's interests.

Now this admirably contrived principle has an evident purpose in view. I have said that in the healthy state our attention is never

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directed to our bodily work, and that work is never interfered with unless it be through some side-channel of emotion or the like. It is when we are not well, when our heart begins to trouble us, our lungs to become enfeebled in action, or our stomach or liver upset, that we begin to pay some attention to the interests of our physical belongings. The French wit, who doubtless himself suffered from dyspepsia, and who said, "Happy is the man who knows not he has a stomach," expressed a great physiological truth. When we are well we do not know we have hearts or livers. When, conversely, any one organ fails in the perfect discharge of its duty, we become aware, first, of its existence, and, second, of the need for some supervision in the matter of its control. Perfect health, then, we see, as regards our body at least, is something of a negative thing. It implies the absence of pain and discomfort, and it means that the physical side of existence is in complete order. It follows that if our affairs are managed for us in this admirable fashion we are great gainers in the matter of the higher affairs of life by this arrangement. For if we had to think about our heart, stomach, and liver perpetu-

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ally, and to worry ourselves with the supervision of acts we have admitted to be essential for the continuance of life, we should have no time whatever for intellectual work. Imagine an existence solely occupied with keeping the heart up to the mark, with supervising the manufacture of gastric juice by the stomach, with seeing that the lungs are kept going, and that the liver is not negligent about its bile-making and starch-storing duties. Life would be intolerable, and would imply that we were mere eating, drinking, breathing, and digesting machines and nothing more. We are all that, however, and much more; and the useful sympathetic department of the nervous system, controlling all our physical processes, leaves thus the brain system free to deal with the pressing questions of the day and the hour.

Once upon a time, when engaged in examining a class of schoolboys in physiology, I inquired of the boy at the head of the class what he did with his brain system, illustrated on a big diagram before the class. "Please, sir," replied the boy, "you do as you like with it!" An admirable answer indeed, for it expresses precisely the functions of the nervous

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system in question. It is the means whereby we literally "do as we like." It enables us to exercise our will, our intellect, our consciousness—in a word, all the qualities and powers whereby we are able to form intelligent conceptions of the world and our relations to it. This much we know for certain about our principal system, which having the brain as its chief mass or centre, includes a very perfect apparatus for the exercise of our bodily control. Thus we find the chief centres of this system to be included within the bony tube formed by the skull and spine. This is a feature seen in all backboned animals from fish to man. Their bodies are all built upon one and the same type, and the brain exhibits a similarity in fundamental structure. Nature's mode of development—or, in other words, evolution—is not to make new types but to modify and improve the one plan, so as to suit the living being for the life it is destined to lead. Hence our nervous system exhibits a broad likeness to those possessed by all our vertebrated neighbours. When, however, we speak of the brain, it is well to remark that we are talking not of one organ but of a collection of different parts, each of which is devoted to the per-



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formance of a special piece of work. By this statement I do not mean the "organs" so called of the old phrenologists. They mapped out the surface of the brain into so many "organs," and labelled them according to the emotions or qualities of mind which they regarded as representative of man's mental nature. They further considered that these "organs" were indicated by prominences or fullnesses on the surface of the skull, and that in turn these developments could be studied through our scalp as well; so that by having regard to the shape of the head, and the development of its various areas or regions, the character and intellectual status of the individual could be discovered. The inspection of a phrenological cast which one may still see in the offices of the phrenologists, who are also mostly "professors," and who profess palmistry and other occult arts in addition, will show how this ancient and effete system of mind-localisation mapped out the cranium into half-inches of "veneration" and "benevolence" here, and other areas of "destructiveness" and "amativeness" there. Apart from the plain fact that no such "organs" as are postulated by the phrenologist can be

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selected or mapped out on the brain's surface itself, we find that science has replaced this old system by a modern and up-to-date exposition of the functions of different parts of the brain. I think if the old phrenologists, many of them careful and conscientious observers, had lived to our day, when the brain as an organ is better understood, and when its mode of working is capable in a large degree of being carefully investigated, they would have undoubtedly modified their opinions. Our real knowledge of the brain has been built up and acquired within a relatively recent period, and we can now approach with some degree of exactitude towards the exposition of how the brain's work is carried out. The faculties of mind are certainly not spread over the brain's surface, as the phrenologists would have had us believe; and you can no more definitely indicate the character or intellectual abilities of a person by considering his cranium, than, to use Sydney Smith's simile, you could diagnose the faculties of the Dean and Chapter of St Paul's by an inspection of the cathedral dome.

When, therefore, we speak of the brain as a collection of organs, rather than as a single

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organ, it will be understood that the "organs" in question are not those of mind formulated by the phrenologist. They are, on the contrary, parts which discharge the varying duties the brain, regarded as the controller of the body, is called upon to discharge. A simple example will illustrate the relation of the brain as a whole to the parts whereof it is composed. I wish to put coals on my fire, and, not being paralysed, I know I am capable of performing the acts involved in that simple duty. I rise from my chair, seize the tongs, open the coal-scuttle, and accomplish my task. Now a whole series of brain and nerve acts has taken place in my history, the succession of which we are able to trace in a fairly satisfactory manner. There is first of all to be considered the thought with which the action began. True, this thought must have been preceded by some other and antecedent idea. I may have felt cold, or I may have simply deemed it desirable to keep the fire alight, and so the further thought was evoked that to replenish the fire became a necessity. Possibly all the events of our lives are connected indissolubly with one another in this manner, and every action or idea may truly be re-

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garded as the outcome and result of some idea or mental state which preceded it. For our present purpose, however, we may take it for granted that the idea of stoking the fire begins the series of acts involved in the latter operation. What thought is we do not know. It may represent merely a storage of the living brain-cells, or it may be a distinct entity as people who speak of "mind" as distinct from brain, are accustomed to regard it. I prefer to adopt a waiting attitude here, and to say, "I don't know," in preference to adopting either view. The idea that our brain-cells secrete thought as our liver-cells secrete bile, is an illustration of one view of matters which, of course, does not commend itself to strictly orthodox people; but, then, on the other hand, the separate entity theory, which regards the brain as a kind of piano, on which "mind" operates as does the independent player, is equally helpless when proof is desired. On the whole, it is better far to own our ignorance of the nature of thought and make an end of argument.

That our thought can be translated into action is, of course, clear. We can effect this latter result or not, just as we please. We

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may think the fire demands renewing, and we may go on thinking so without stirring a muscle to carry out our intent. When, however, we do determine to keep the fire going, our thought becomes transmuted into a series of acts. It must, somehow or other, be transformed into that particular kind of force or energy which we call "nerve-force," and must be thus rendered capable of being sent as a message along the nerves that stimulate the muscles we wish to bring into play. This much is clear ; for otherwise than on the theory that our brain-cells have the power of issuing forth their behests to the body, we should have no means of ruling the physical territory we call our own. In the shape of nerve-force, then, the message speeds along the nerves, excites the muscles to action, and to very definite action as well. This latter event is provided for by the brain's sub-offices, which, in the shape of definite centres, each devoted to regulating the movements of particular muscles, control these muscles and deal with the messages that are intended to call them into play. Thus the muscles are brought into action, and our purpose is duly carried out. And a very complicated series of movements

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are involved in what is apparently a simple enough act. Muscles of the limbs, those of the body, of the eyes and of the head, are all duly affected by the idea of the brain, which, like the pointsman in the busy signal-box of a large railway station, must possess a power clearly and definitely of directing its messages and commands into the special channels provided for the muscles it desires to affect. The process, however, does not necessarily end here. We become conscious that the act is being and has been performed, and it is clear that means must exist for the brain, or that part of it which is the seat of intelligence, being informed of the fact. The outgoing messages have brought the muscles into play, but ingoing messages must have conveyed to the brain the information of the successful accomplishment of its ideas. In the case before us, our eyes have clearly been one means of informing the brain that the work has been done, our sense of touch, and probably other senses as well—hearing to wit, and the heat sense—have also played their part in the transmission of the intelligence that the fire has been replenished. We thus come to discern the great principle on which

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all our nervous acts are carried out, and that principle, first clearly formulated by Dr Marshall Hall, is known as "reflex action." This name is in itself explicit enough. We mean to imply by the term "reflex action," that the original message is "reflected" or varied in its course, as it were, and one may fairly say that there is not an act of our lives which is not performed on this kind of duplex telegraphic system.

Simpler examples of reflex action are numerous and serve to illustrate how our existence is controlled by the reflection of the impressions which travel from body to brain or from brain to body. I might go further and assert that in place of saying from brain to body, it would be more correct to say that impressions pass from and to "nerve centres." A "nerve centre" anywhere in the body is a mass of "nerve-cells," which, later on, we shall note are the essentially controlling parts of the whole nervous system. We have nerve centres in the brain, of course, some of more importance than others, but we also find centres in other parts of the nervous system. The spinal cord, for example, owns many nerve centres as essential parts of its

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constitution, so that it is not necessary for us to suppose—indeed it would be erroneous for us to believe—that the brain is alone concerned in the despatch and receipt of the body's telegrams. What we require for the discharge of any and all nervous acts are, first, a nerve centre ; second, an outgoing nerve fibre ; and, third, an incoming fibre. Given these three items—there may be others, of course, involved—and we may note how the body's business, and its external affairs especially, are dealt with by its nervous apparatus. To select as simple an illustration of reflex action as we may find, let us take the case of a man withdrawing his head from a threatened blow. Analysed out, his action begins at the eyes. He sees the impending blow, and at once draws back his head. He does this unconsciously and automatically, for it is clear there is no time to think if he would save himself from the consequences of the attack ; and the action is all the better and more instantly performed because it is unconsciously carried out. All our instincts which lead to self-preservation are practically illustrated in this fashion, and because of their automatic character are perfectly discharged.



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The eyes, however, it is clear, are mere "gateways of knowledge," as George Wilson long ago happily designated our senses. The eye is only a window of the brain; it has no power of apprehension in itself. It is a mere receiving-office without powers of decision or command, and of every other sense-organ the same truth holds good. The eye collates certain impressions from the outer world, and transmits them to the brain, and to that portion of the brain which, as a sub-office dealing with messages coming from the eyes, is specially set aside for its work. Even when the eyes' sub-office receives the message, the reflex action is not by any means completed. The sub-office must telegraph to the centres in the brain which have to deal with the muscles that require to be called into action. The intelligence department, in other words, has to issue its commands to the executive, and so, in one way or another, the executive of the brain at once flashes forth a reflex message to the muscles of the head and neck withdrawing the head from the threatened blow. Put in its most simple terms, then, we see the ingoing message received by the brain centres, and "reflected" as an out-

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going message producing the desired result in the muscles. The reflex action, however, need not cease with the withdrawing of the head. A whole series of acts may further ensue as a consequence of the original reflex. Thus, if our opponent be a formidable adversary, we may regard discretion as the better part of valour, and the commands of the centres may extend to the muscles of our legs, carrying us out of the reach of danger. Contrariwise, we may elect to stand our ground, to show fight, and to chastise our enemy, in which case another discharge of reflected messages will take place enabling us to make suitable reprisals. We see much the same action exhibited in the case of a man crossing the street rapidly to the safety of the pavement when he hears a vehicle behind him driving up at a rapid pace. His ears convey to the brain, by the auditory nerve, the intelligence that danger is present in the shape of the approaching cab, and the reflex message to his muscles quickens his movements towards the side-walk. Similarly, a mere mental impression may give rise to reflex action. If the remembrance of a sour or nauseous taste brings a flow of saliva into the mouth, the original message from the brain

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to the salivary glands is reflected in the consciousness that saliva is being unduly secreted. The mouth "watering" at the sight of some dainty dish, is an example of a reflex which, beginning at the eyes, passes to the brain, and is reflected to the salivary glands. This action is often uncontrollable, and the sight of a person eating a sour apple or sucking a lemon will as readily bring about an increased salivary flow as will the presence of food in the mouth, which last, by the way, is an illustration of a very natural reflex indeed.

In physiology the ingoing message is always spoken of as a "sensory" or "afferent" one, because it travels onwards along a sensory nerve which has no power of carrying messages in the opposite direction. The outgoing message is spoken of generally as a "motor" or "efferent" one, seeing that its object is to give rise to movement of one kind or another. There is no doubt that within the compass of the brain itself reflexes are perpetually passing which may give no external indication of their action at all, and even in sleep, when a chill night suggests a dream of climbing on ice, or a hot bottle to the feet gives rise to a dream regarding an expedition up Vesuvius and a

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walk amongst lava, we see illustrated the reflex action of the nervous system. The external impression transmitted to the centres is reflected to the parts which, representing the night-staff of the brain, liberate their energies in the shape of our nocturnal visions. It is probable that many of our dreams actually originate in this fashion by external circumstances, and we know that it is possible to suggest a dream to a sleeper in some cases by whispering in his ear. I have alluded to the fact that there are many centres in the nervous system other than those of the brain ; and I instanced the spinal cord as an illustration of this fact. There are scientists who tell us that while the reflexes that own the spinal cord as their seat are natural, those in which the brain takes part are acquired. This distinction is probably of too hard and fast a character to be universally accepted, but it is true that many of those actions we collectively call "instinct," on the part both of man and lower animals, are simply cases of inherited reflex action. If a frog which has been decapitated will remove with one foot a drop of acid which has been placed on the thigh of the other leg, it is clear the spinal cord must be the

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seat of this reflex action ; but if we saw this act performed by a normal frog, we might not unnaturally attribute its seat to the brain, and yet there can be no conscious or intelligent action in the absence of the brain. Probably in ourselves, as I have suggested, a great many of our acts are just as automatically and irresponsibly performed as is this action of the frog. Over some of them we have command, and over others we possess no control, while occasionally we may see an otherwise natural reflex act hindered or absolutely prevented by the influence of mental emotion.

One of the best illustrations of the fact that even our reason may be incapable of giving our will control over our reflex acts is that cited by Darwin as having occurred to himself. "I put my face," says the great naturalist, "close to the thick glass plate in front of a puff-adder, in the Zoological Gardens, with the firm determination of not starting back if the snake struck at me ; but, as soon as the blow was struck, my resolution went for nothing, and I jumped a yard or two backwards with astonishing rapidity. My will and reason were powerless against the imagination of a danger which had never been experienced."

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Here the reflex action, preservative in its nature, was obviously too strong for the will to overcome it and to inhibit and prevent it.

If we take the opposite view of things, we may find occasions on which the mental influence stops the reflex action. The well-known practice of the Indian priests offers a case in point. Summoned by the master of a house to detect a thief among the servants, the priest gives to each a little dry rice which is to be kept in the mouth for a time. The rice is duly examined by the priest with the result that while the anxiously innocent persons have duly moistened theirs with saliva, that of the thief remains dry. The natural reflex has been inhibited and stopped by the mental factor; the consciousness of guilt being no doubt largely intensified by the degree of respect which is attached to the priest's supposed powers of detection.

Another instance of reflex action, and one which plays no unimportant part in our social life, is that known as "blushing." There are obviously two sides to this interesting topic. There is the poetic and æsthetic phase, which sees in the blush the criterion of that maiden modesty which has a very distinct charm

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withal regarded as an attribute of beauty at large. The other aspect of the blush is that which sees in it—when a male person is the subject thereof—a sign and symptom of awkwardness and diffidence. But more scientifically regarded the blush has a distinct genesis of its own, and its social significance is matter of after-interpretation. Young, of “Night Thoughts” fame, expresses the opinion that “the man that blushes is not quite a brute,” and illustrates thus-wise the opinion that this display of emotion shows that the subject thereof has not lost all sense of moral responsibility. But a blush may mean anger and indignation, as well as modesty or shame, and we see in the varied meanings which have become attached to this action an illustration of that evolution of the emotions whereof Darwin and others have learnedly discoursed. There can be no doubt first of all that we share many of these emotions, which simply represent special kinds of reflex action, with the lower animals. Look at a man who sneers, and who, as the essential part of that act, uncovers the upper canine (or eye tooth) of one side by raising his lip. Compare this act with that of the dog who is snarling and

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about to display his ill-temper, and you will readily recognise the likeness and similarity of the two actions. In the man it is the signal of his temper, just as it is in the dog. The latter is uncovering his teeth preparatory to using them; the man is metaphorically, as well as really, "showing his teeth" as a mark of his impending anger. Lower animals "blush" as we do. Darwin remarks that monkeys redden from passion, and I can fully confirm this fact. I kept a monkey called "Jenny" for a year or two, and she became a great pet, and was devotedly attached to myself. If anyone approached me roughly, or in jest when she was seated by me attempted to strike me, "Jenny's" teeth would chatter, and her whole face became suffused with the veritable blush of anger. In human life the blush, as we have seen, has come to be translated in terms of emotions such as lower animals may not be regarded as capable of evincing. Darwin calls blushing "the most peculiar and most human of all expressions," and this is perhaps true, but all the same, the genesis of the blush is to be found far down in the scale. Man has translated the reddening of the skin into his own special terms, which



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mean anger, modesty, shame, and the like, whereas in the lower animal possibly the sole cause of the blush is anger itself. The blush begins as a purely mental effect. The origin of its mechanism is always in the brain and not in the body. The indirect cause of the blush, of course, comes from the outside world and begins the reflex which ends in the skin effects. You hear something which insults you, and you flush up at once. The course of the reflex is from ear to brain and from brain to the centre governing the minute blood-vessels. You see something which rouses a storm of indignation in your breast, and the eye discharges in its own way precisely the same duty as the ear. The blushing mechanism is an interesting study. A special part of the nervous system is set apart for the control of the blood-vessels of our bodies. The importance of this supervision of the circulation cannot be over-estimated, seeing that the nourishment of our bodies depends largely on the regulation of the blood-supply which each tissue receives. We find accordingly that the blood-vessels, even the minutest ones, are provided with a muscular coat, the muscular tissue represented therein being of in-

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voluntary nature, or, in other words, lying outside the direct influence and dominance of the will. These muscular fibres exercise the functions of dilating and contracting the calibre of the blood-vessels, and of thus regulating the supply of blood to any given part of our frames. Now the muscular fibres of the vessels are under the control of a special centre—called the “vaso-motor centre”—which is situated at the top of the spinal cord or base of the brain, and the nerves which pass from this centre to the vessels are appropriately enough termed “vaso-motor nerves.”

When no special influence is being exerted by the nerves on the blood-vessels the latter are kept neither expanded nor contracted, but in a state of ordinary tension which affords a fair and proper supply of blood to the body. This condition is kept up and maintained as the result of the natural influence of the vaso-motor nerves on the vessels. But the case alters when in consequence of some outside event or stimulus, the influence of the brain is brought to play on the vaso-motor sub-office. When there is a disturbance in the executive department the minor officials are

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affected in a corresponding fashion. Suppose the brain receives an impression which gives rise in the intellectual centres of a feeling of shame or anger, or which may call forth as a corollary of the first-named state "the blush (of modesty) mantling the maiden cheek," then the subordinate official in the vaso-motor centre is stirred to action. Why this should be so is a difficult matter to explain. The nerve-impulses make tracks for that centre in obedience to some law or other which has favoured the readier discharge of nerve force towards that centre than towards others, although other centres may readily enough be also called into play, as we have already noted. Possibly in lower life the increase of colour in the skin produced by the act of blushing may have been aggravated with the purpose of producing some effect or other of a terrifying nature on an opponent. But the exact genesis of the blush may be left for evolutionists to determine ; that which concerns us here is its mechanism. And so to the vaso-motor nerves from their sub-office proceeds a command which has the effect of making things less stringently conducted in the matter of the tone of the blood-vessels. There is immediately

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wrought out in the centre a restraining or inhibiting influence ; the moderate contraction of the blood-vessels, and especially of the microscopic capillaries of the skin, is exchanged for a condition in which the vessels grow wider and become distended. More blood is therefore permitted to enter them, and the whole surface affected shows the characteristic "blush." The act of blushing is therefore entirely an involuntary one. Once set in operation by the brain's order to the vaso-motor centre, the will has no power to restrain it. What the will may do in a resolute person is to inhibit and arrest at the outset the impulse, to the propagation of which to the vaso-motor centre, the blush owes its origin ; and that it is possible thus to stop or to limit the blushing mechanism is, of course, matter of ordinary observation. The opposite condition, that of the face growing pale from fright or other form of "shock," is produced by a reversal of the action to which blushing is due. A different emotion—or curiously enough a similar emotion such as is represented by anger—will produce a pallor of the skin, seen in its most typical development in the fainting person. The paling of the skin is due not to

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relaxation of the blood-vessels, but to their being tightened up, as it were, by the action of their nerves in contracting the calibre of the tubes. Here the influence is that of stimulating the vaso-motor sub-office. Its official cells are aroused to increased vigilance and activity. This message to the vessels causes them to contract; a lessened flow of blood is the result, and the skin-surface becomes pale and cold.

In connection with this curious and interesting mechanism that is responsible for the display of our emotions, we may note that the heart itself, as the central organ of the circulation, has its interests looked after by a nervous arrangement of an equally important kind. The heart is liable to be influenced largely by the mind, and this although, as we have seen, its work is carried on independently of the attention and the will. In fact, when we think of the use of the word "heart," as it is metaphorically employed in our ordinary talk and conversation, we are able to understand how, from olden days, the idea that the heart was the seat of understanding has been theoretically projected onwards to our own

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times. The ancients knew that the moods and tenses of the mind were reflected in the heart's action. They observed it depressed by grief and stimulated by joy. The "pulse of hope" is the opposite of the beat of despair; and so the terms "good-hearted" and "bad-hearted," and like phrases, indicating that the heart was the emporium of the good and evil that intermingle in human life and actions, came to possess a reality and force for the older writers that have caused the phraseology in question to remain with us as part and parcel of our common vernacular.

There are various nerves to which the heart owes its regulation, and to the varied action of which the display of emotion as illustrated by the heart's movements is due. Thus, if we begin with the ordinary work of the heart, we find imbedded in its substance—the heart is a mass of muscles—certain centres which are termed the "cardiac ganglia." These are like storage batteries of nerve-force. They stimulate the heart-muscle to its ordinary routine work of contracting to send blood throughout our frames. But there are certain of these masses of nerve cells which exert a

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restraining influence on the heart, and tend to regulate its work rather than to incite it to perform its duty. Between the two influences, then, the heart is kept working at what we may call its jog-trot pace. This is the arrangement of the heart's own nervous masses, and therein it resembles a physiological Isle of Man, with its own House of Keys, whereby its local affairs are duly administered. But the heart also exhibits another likeness to Manxland. That Home Ruled state owes allegiance to the Imperial Government, and the heart is similarly connected with both nervous systems by distinct nerve-trunks. There is first of all a nerve known as the "vagus," which, if its functions be investigated, is found to be connected with those centres that control and restrain the heart's movements; for if this nerve be stimulated it slows the heart. Then, second, we find the "sympathetic" nerve of the heart which, similarly studied, is found to quicken the action of our bodily pumping engine. Regarded as a horse, therefore, we might say that the heart's own centres keep it moving in a jog-trot fashion, that the vagus nerve represents the bit, and the sympathetic the whip or spur. The arrangements described,

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however, do not quite exhaust the whole story of the heart's regulation.

Yet another phase of heart-control brings us back to our vaso-motor centres and to the control of the blood-vessels. If, from any cause the blood-vessels of the body are in a state of contraction, we may see that the heart will require to exert additional force to propel the blood through them. Now, the heart may be able for a time to supply the increased amount of energy necessary for the efficient discharge of its work; but, as in the case of every other muscle, continued exertion of this nature would certainly cause it to stop work altogether. Nature has therefore provided a most interesting nervous mechanism whereby when the heart is hard-pressed by its work, it cries for and obtains relief. The mechanism in question concerns the action of a certain nerve to which the name of the "depressor" is given. Now this nerve carries messages not from brain to heart, but from heart to brain. It is a "call" nerve in place of being a "command" one. Hard-pressed by its work, a message passes along the depressor nerve from the heart to the vaso-motor centre at the top of the spinal cord. We have



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seen that it is this centre which has charge of the blood - vessels. Accordingly, when the heart's call reaches this centre, we find that sub-office at once exerting a restraining influence, such as we saw to be produced in the act of blushing. The blood-vessels of the body, and especially those near the heart, are made to expand, so the flow of blood along them from the heart, and indeed all through the body, becomes easier. The blood pressure is lessened, so to speak, and the heart is relieved of the tension which it required to exert in its work of driving blood through narrow channels.

The influences which the nerve centres and nerves of the heart exert in producing emotional displays need not be specially dwelt upon. The faster beating of the heart is due, as we may see, to the brain's action on the sympathetic nerve-trunks, just as the restraint of the organ is caused by some influence affecting the vagus nerve. A blow on the stomach or chest may cause a man to faint, because the reflex has passed from the nerves of the affected part to the brain, and has thence been reflected to the vagus nerve, producing temporary stoppage or delay of

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the nerve's action. The heart, therefore, plays a distinct part in the expression of our emotions, even if it be true that it has been deposed from the place of honour which it once occupied in ancient days as the seat of intelligence itself.

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## CHAPTER III

### BRAIN CELLS AND NERVE CELLS

**A** HIGHLY important section of our studies is that which teaches us the build of the nervous system in respect of the microscopic elements whereof it is composed. A new world has been revealed to us in respect of recent investigations into the composition of our nervous apparatus—researches conducted according to improved methods, whereby the very minute features of the nervous apparatus have been brought under our ken. A knowledge of what the nervous system means and implies when it is microscopically dissected out is absolutely necessary for the due understanding of certain phases of our social life, as well as for the amelioration of many of the erratic ways and works of the system in question. We may commence our study by the distinct assertion that any nervous system, whether it be that of a jelly-fish or of a man, is composed of two

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elements only. These elements are, first, "nerve cells," and, second, "nerve fibres." It is important to note the distinction between these two items. A "nerve cell" is the maker, originator, call it what we will, of "nerve force," that is, of the special form of energy which we know is transmitted by nerves to affect the body, or *vice versa* is carried from the body to affect the nerve centres. Already we have seen that "thought" is transmuted into nerve-force for the purpose of carrying out the brain's behests; and whether we are to speak of "thought" and "nerve-force" as distinct, if convertible phrases of things, or whether we elect to regard them as manifestations of essentially the same form of energy, one thing is clear, namely, that we can only obtain nerve-force, or find it generated by a "nerve-cell."

The "nerve fibre" is a different thing entirely. It is only a conductor or carrier of nerve-force. It has no power to generate the energy it conveys. That is the work of the nerve cell. Comparing the body to a telegraph system, we see in the nerve cells the batteries that generate the electricity, and in the nerve fibres the waves that convey it. As the

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wire has no power to produce the impulses it carries, so the nerve fibre cannot initiate or develop the energy it is destined to transmit.

If so much is clear regarding the original and fundamental constitution of the nervous system, what follows will be easy of comprehension. The nerve cell may first engage our attention. A "cell" is the unit of the living body. Our bodies begin each as a living cell, averaging in diameter about the  $\frac{1}{120}$ th part of an inch. The bodies of the lowest animals and plants never get beyond this single-cell stage. The higher animals are many-celled on the other hand, the original egg-cell, or germ-cell, giving rise to many other cells, which are the bricks whereof the body is built up. All cells are, of course, microscopic in character, and many of them are exceedingly minute. Each cell, to start with, is a speck of protoplasm, or living matter. All active cells in the body are such living specks, and some of them, such as the "leucocytes," or white cells of the blood, have a kind of roving commission, in that they roam out of the blood-vessels and through the tissues, as if they were independent organisms, for the purpose of removing any deleterious matter

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that may have found entrance to our frames. Cells, of course, die, and others are reproduced to take their place. A scratch on the skin is healed up by the production of new cells, which take the place of those that were destroyed, and our whole outer skin is in perpetual process of renewal, since the old cells that have been pushed up to the top are removed by washing and by the mere friction of our clothes, while new cells developed from below continually replace the effete units. In one sense a human body might be regarded as a kind of country where the government was a constitutional monarchy. Its population consists of cell-colonies or counties that compose the various tissues and organs in their most typical state. Some of these cells are of minor importance; such are those of the outer skin. Others are more prominent; such are the cells of the liver, of the glands of the stomach and the like, which carry on the work of these organs. Others, again, are more important, because they govern the country; such are nerve cells, and if these last at large represent the body's Parliament, then the highest cells of the brain, discharging the functions which we associate with the

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exercise of the intelligence and the will, must be regarded as representing the Cabinet of our bodily State.

It would seem as though we came face to face in our brain cells with the mystery of being, and so in one sense we do. We have already discussed the impossibility of arriving at any adequate conception of the nature of thought ; but it is a fairly defensible position to assume that brain cells (or rather certain of them) are its instruments, and that in accord with our sensations, thoughts, and mental actions at large, there must occur in the brain cells some equivalent changes or processes. It is precisely the nature of these processes of which we are ignorant, although one day the light of science may make clear this dark place in our knowledge of ourselves. Now nerve cells at large are all extremely minute things, whose diameter may be reckoned up in the five and six-thousandth parts of an inch. Each is a tiny mass of living matter, and each presents us with certain features which it is important to bear in mind. Through special modes of staining nerve cells with various chemicals we have been able to trace out their structure and

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connections in a manner which has thrown a flood of light even upon the intricacies of our brain elements. In the first place each nerve cell—called a “neuron” by many physiologists—whatever be its shape (triangular in the brain centres, or more or less rounded in other parts of the nervous system), possesses inside it a central particle called the “nucleus,” and this latter in turn bears a lesser particle called the “nucleolus.” These things are seen in other cells, but the nerve cell in addition gives off two kinds of processes or prolongations of its substance. From one extremity we see proceeding branches called “dendrons,” which show other little branches at their sides, as a feather composed of a main stalk gives off its barbs. From the other extremity a nerve fibre is given off, and there may be more than one such fibre proceeding from a nerve cell. While the dendrons are short, the fibre may be very long, and passes out from the cell, since it is the channel whereby the messages of the cell are conveyed outwards, say, to the body, or, it may be, to other cells. The dendrons, on the contrary, are the tracts which carry messages to the nerve cell, either from the body or from neighbour cells with which it is



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in contact. It is characteristic of higher animals that the number and complexity of the branches given off from nerve cells, are much greater than in lower forms. The mechanism, in other words, is more complex according to the greater intricacy of the work it is called upon to perform. Such a distinction is also seen even in man's own nerve cells. The higher their duties, the greater the number of connections they exhibit. This complexity is specially seen in the manner in which impulses are conveyed from brain to muscle, as in the exercise of the reflex action we have studied. The fibre which is given off from a nerve cell, and which conveys its message outwards to the body, may not proceed directly to the muscle. What we find is that the fibre ends in a kind of branching arrangement, which brings the fibre in contact with the "dendrons" or branches of another and different nerve cell, and it is by means of the fibre of this latter cell that the original message is sent to the muscle. And it may be also that in the case of this second or relay cell, while one of its fibres goes to the muscle, another may return to the brain, thus showing us the track of a reflex action, and so the complexities

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of the cell connections may be increased to a still further degree.

As living things, nerve cells exhibit the phases of work and rest, of the necessity for repose after exertion, that are illustrated in the history of all animated beings. It is known that a wearied nerve cell shows changes of a very definite kind in its living substance when it has been active for some time, or, in other words, when it is tired out ; and the necessity for sleep and repose is thus seen to be founded upon a very decided condition pertaining to the constitution of the units which rule our destinies. The call for rest, in fact, represents a crying necessity of life at large, and the history of our brain cells particularly throws a new light on the probable cause of sleep itself. Not so very long ago it was believed that every nerve cell was connected to other and neighbour cells by means of its "dendrons," or branches already described. That this idea is a mistake, however, has been abundantly demonstrated. It is known that our brain cells, for example, are merely in contact with each other, but are not connected as inseparable parts of a whole. They are in contact only just as one may place the tips of the

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fingers of one hand in contact with the fingertips of the other.

Furthermore, it is evident that this constitution and arrangement of the brain cells indicate that the contact is not permanent, but suggests, on the other hand, that it is as frequently broken as it is made. If, as has been supposed, there is only contact when one brain cell has a message to convey to another, this idea, if proved, would only confirm what we know to be true, namely, that it is contact, and not continuity, that represents the relationship between our brain cells. Observation of the cells on the brains of certain lower transparent animals has shown that they do extend and withdraw their dendrons, and that this mode of action represents the natural working of these units. How this contact is made and broken between our brain cells is of course still matter of theory. One observer maintains that it is the current of nerve force which, as it flows from the cell, elongates the branches and brings them into contact with those of neighbour cells. Another view holds that some chemical action is the cause of the contact, while a third theory sees an explanation in certain surroundings of the brain cells.

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They are imbedded in a kind of tissue also formed of cells, provided with many radiating branches. These latter constitute what in science are named "neuroglia cells." Their duties were formerly presumed to be those of nourishing the brain cells, but the newer view sees in them the means for separating the brain cells from one another. Thus in a state of activity, when messages have to pass from group to group and from cell to cell, we may suppose that the branches of the neuroglia cells are retracted, and free contact is thus allowed to be made betwixt the dendrons of the brain cells. On the contrary, when there is need for repose, and when the contact between the brain cells has to be broken, the neuroglia cells are believed to expand their branches, which, mechanically, as it were, force aside the dendrons and isolate the cells from which they spring.

These views of the movements of our brain cells lead us to some theoretical knowledge of the intimate work of the brain, which knowledge, even assuming that it is mostly hypothetical as yet, nevertheless supplies a gap in our investigations and reflections concerning certain phases of our mental life. What,

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for instance, if it should prove that the association of ideas we call "memory," depending on the connection of groups of brain cells with their stored-up recollections, is, after all, a matter of the contact of the cell branches? The accurate memory, subserving readily the work of its owner, would represent the case of cells where contact was quickly made, while the imperfect memory would conversely present us with a state of matters in which the contacts were delayed, or only feebly carried out. Then there is the interesting topic of sleep and its nature, which may be explained clearly enough, I think, by a reference to the facts we have been discussing. We must here distinguish between the ordinary phenomena of sleep regarded as part of the brain's phases and the exact cause of our somnolence. For instance, we know that in sleep the blood-pressure on the brain is diminished. The brain substance grows pale and anæmic, and the brain itself retreats from the skull and sinks within the cranium. But all this information does not lead us towards an explanation of the exact cause or causes to the action of which sleep is due. The paleness and lowered blood-pressure are results

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and not causes in themselves. There must be some condition which, as a primary phase of things, brings about the changes in the brain we are able to see. Now that condition may very well be represented by the action of the brain cells we have discussed. In the waking state, our brain cells are in active contact, and connections between them are being made and broken perpetually in carrying out the work of body-direction and control. But when fatigue supervenes, and we grow tired and weary, we may believe that the neuroglia cells pushing their branches upwards and between the brain cells, break the contact and render the work of the cells no longer possible. This act of separating the dendrons of the cells, whether accomplished in one way or another, is, I think, the determining cause of sleep. The other conditions which mark the onset and duration of sleep are the results of the weariness of our brain cells, they are not causes in themselves.

The topic of memory itself demands a further word or two by way of relating it to its place as a brain function. We are ignorant, of course, of the manner in which recollections and impressions are stored up in our brain

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cells, but it is a certainty that they are so stored, and, moreover, that they are capable of being reproduced for the purposes of our existence. The innumerable connections of events with each other are foreshadowed, as it were, in the relations of our brain cells, and it may well be that special groups of these cells are specially charged with the duty pertaining to memorising work. Furthermore, the reason why our memories are not all set in operation at once, and why we are capable of evolving recollections of special things, would appear to be rendered clear to us by reason of the nature of our brain cells and their connections. The contacts between groups of cells are regulated so that we call into play only those cells that pertain to the particular business we have in hand. The memories we do not require to be resuscitated are put out of court, because the necessary contacts between these storage cells are wanting. So also, we may be able to form some idea concerning the special features seen in the memory of old persons. It is alleged as a scientific fact that we are born with the maximum number of brain cells we may possess. No increase of these cells takes place during life, but, conversely, we know that in old age

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the weight of the brain undergoes a decrease. The old person is apt to talk more about the days of the past, and to babble about his youth, than he is to converse about recent events. This peculiarity may find a physical explanation in the idea that the brain cells which are the first to disappear will be those which have served us in the active period of our existence. With their disappearance, other cells, which probably were those more concerned in the affairs of our early life, come to the front. They are disinterred, as it were, by the decay and removal of the more active cells, and so it is these memories which come to be paramount in the old man's talk.

Memory itself, however, is a topic which deserves more practical recognition as a factor in our social life than we are possibly inclined to believe. It is undeniable that a good memory, that is, one serviceable all round for the renewal of our ideas, is an inestimable boon to any person, while the defective memory is a constant source of trouble and worry. Few of us pay any attention to the cultivation of the memory, and one mostly comes to grief in this matter through the simple effects of the operation of the law of disuse. Nature's



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law is to dispose of and to obliterate parts and faculties which we do not legitimately employ, and the memory-faculty is no exception to this rule. A good memory is undoubtedly the product of exercise, even if we admit that there is something to be said for inheritance giving us a fair start with brain cells of healthy type. As a rule there is no systematic use of memory on the part of people at large. It is a haphazard function in a way, or rather it is exercised in a perfectly haphazard fashion, with the result that we suffer in coherence, in convenience, in comfort, and often in pocket as well. The foundation of all memory work lies in the ability to make quick and accurate associations of ideas. We often see this association illustrated when a chance expression in a story causes a hearer to say, "Oh, that reminds me!" as the prelude to what is perhaps a very complex train of associations in the way of memory; and yet that memory would have remained perfectly dormant but for the chance stimulation. The good memory may be compared to the orderly photographer who, when asked to find the negative of a photograph he took years ago, knows exactly where to put his hand upon it in his arranged

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and numbered series. He finds the negative and prints off the photograph. The weak memory is the untidy and careless photographer who knows not where to find the negative wanted, and who requests you to call again, with the result that days afterwards you may be told the negative is found, if, indeed, it be discovered at all.

That we never really forget anything we either see or hear, or have had conveyed otherwise to our brain cells is, I think, a fairly reasonable hypothesis. Many circumstances of our ordinary life prove this. To begin with, we have flashes of memory cropping up continually regarding people, events, or even thoughts that one might well have imagined were absolutely extinct. Even a whiff of scent will sometimes awaken a perfect train of recollections of days long gone by. It is *le premier pas* which acts here, as elsewhere. The initial difficulty is to find the connecting-link in the shape of a word, an idea, or other phase of mental life, which shall start a memory cycle. The enormous crowd of recollections every man must amass is no barrier to the cultivation of a good memory. The numerical side of our impressions is a negligible quantity

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here, for "practice makes perfect" in the matter of memory as decidedly as in any other aspect of existence; and it is the constant use of the memory over whatever details concern us that alone can aid us in the cultivation of the faculty. The idea that we really never forget anything may also be proved by a circumstance which is within the cognizance of us all. Suppose I go to hear a new opera. I listen attentively to the music, but when the performance has concluded I am unable to recollect even the numbers that have most enchanted me. Even the waltz refrain that runs through *Romeo et Juliette* I could not recall to mind, striking as is the music. But consider what happens a few days later. As I walk along the street I catch myself in full song, whistling the refrain which by no exercise of memory could I have recalled the night of the performance. This proves to us, I think, that our brain cells receive all things which are brought under the cognizance of our senses. We really treasure up everything we see and hear, and we can reproduce what we have seen and heard as occasion demands, or as we stimulate our memory cells to their work. The difficulty is in getting these cells

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to evolve their impressions. They will do this spontaneously often enough, revealing to us memories whereof we have not had the slightest recollection, showing what a wealth of ideas are stored up within the confines of our crania. Doubtless each of us tries to cultivate a special memory for the class of work our hands and brains find to do. The lawyer will memorise leading cases ; the doctor will strive to tabulate his clinical experiences ; and so on ; each one may cultivate memory for his own affairs. The higher art in memory cultivation is that of acquiring a good, all-round recollective faculty which will serve our turn in all the affairs of life. There is no panacea for attaining this desirable result. It is a question of grim, constant employment of the faculty of recollection, which, by the way, is quite willing to assist us if we will only endeavour to coax it into action. You meet a man in the street, and you have forgotten his name, and also the circumstances under which you have met him. But your memory when stimulated, as likely as not, will give you the first letter of the man's name, and this clue once obtained, you will make associations between brain cells that will supply the rest

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of the answer to the question "Who is he?"

The question of bodily fatigue is also an important one in so far as the memory is concerned. Sir Henry Holland relates an incident which is highly typical of the "relation" between bodily and mental states. He had been travelling in the Hartz Mountain district, and had been without food or rest for a prolonged period. When he arrived at an inn he found he had forgotten the German for bread and wine. He was supplied with food, and after his refreshment his knowledge of German returned completely. In our ordinary social life there are many illustrations to be found of the same fact. When we are tired or worried, our memory proves false to us. When we are in our normal state, or even when we are excited, we are capable of veritable feats in the matter of recollection. The lesson we learn here is all-important. The dependence of what we call "mind" upon the bodily state is a truism we should take more account of than we do. The supply of the brain with pure blood, well oxygenated, is a necessary condition for healthy mental work. So far, we see that good food, pure air, and the

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other conditions of health, are precisely those which enable our brain to discharge all its duties in a perfect manner. When we fail to supply these conditions we qualify for erratic brain-action, and land ourselves in that territory which is the border-land of disease.

In concluding our survey of the working of the nervous system, we have to consider the "nerve fibres," which I mentioned as one of the two chief elements whereof that system was composed. The nerve-fibres build up and compose the nerves. They are arranged in each nerve in bundles, and each fibre has a definite end in some part of the body. Certain fibres, of course, carry messages from the central parts (brain and spinal cord) to the body, and other fibres are devoted to the task of conveying messages from the body back to the nerve centres. It is in this fashion that "reflex action" is carried out. Every ordinary nerve within the body contains two kinds of fibres—those which go from the centres to the body, and those which carry impressions from the body back to the centres. No microscopical investigation reveals any difference between the outgoing fibres and the incoming ones. The proof of this arrangement

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was furnished by Sir Charles Bell in his researches into the manner in which the nerves are given off from the spinal cord. It is found that each of the spinal nerves originates from the cord by a double root. One root is given off from the front part of the cord and the other from the hinder part thereof. By experiment, Bell showed that if the front root of any nerve was cut, the animal lost all power of movement, but retained sensation in the parts supplied by the nerve. If, on the contrary, the hinder root alone was cut, the animal retained the power of movement but lost sensation. This experiment proved that impulses which go from brain or cord to body, pass out by the front root, and by the fibres which represent the direct continuation of that root. Contrariwise, when impressions pass from body to cord or brain, the message must be conveyed along those fibres of a nerve which are continuations of the hinder root, and which carry those messages onwards and upwards to the centres. The mechanism by which our bodily actions are carried out are thus clearly enough defined. It is as if we possessed two sets of telegraph wires, one set employed in the carriage of impressions out-

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wards, and the other set devoted to the conveyance of messages from without inwards. But it is the nerve cells in the brain or elsewhere which are the ruling and controlling elements of the nervous system. They represent the units which constitute the court of appeal, as it were, for all our actions. Some of them have minor duties to perform ; others, such as the cells of the intellectual centres in the brain, perform functions which correspond with those discharged by the Cabinet of a government. In this light of things, we can clearly see that the higher brain cells not only represent us, as we are, in the truest sense of the term, but in all other respects rule and control the destinies of each individual.



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## CHAPTER IV

### THE HEALTH OF THE NERVOUS SYSTEM AND HOW TO PRESERVE IT

**H**AVING investigated the manner in which we are governed by "our noble selves," it remains for us to apply the knowledge we have acquired in the due regulation of our lives. It may be said, of course, that health at large depends on the proper regulation of all our bodily functions. This is a true and exact statement no doubt, but the part played by the nervous system in respect of our physical welfare is vastly more important than that which is represented in the work of other systems which we own as part of our belongings. The nervous system is really king of our kingdom, and its work for good or evil in our history is, beyond compare, far greater than that exhibited by any other series of organs included in our bodily belongings. We certainly know that the welfare of the nervous system depends largely upon

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conditions with which the other organs are concerned ; but just as Cabinet ministers feed on the same food as the people, and as they breathe the same air, so our nerve cells while dependent on conditions common to the other cells of the body, nevertheless, in their own sphere of influence, have power to produce effects which appear, and are, out of all proportion to those resulting from the work of other cells. The nervous system demands, in a way, the best of everything the body has to produce. It must have pure blood, pure air—which means plenty of oxygen—and it demands certain other addenda and extras without which it cannot discharge its functions in a healthy fashion.

The natural nourishment of the nervous system includes a due supply of food, and that of special character. A German philosopher, having regard to the fact that phosphorus is an element abundantly represented in nerve tissue, placed on record the memorable aphorism, "No phosphorus, no thought." There is undoubtedly some truth in his assertion. Phosphorus is an element which is closely associated with the physical welfare of the nervous system, and it is, of course,

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a notable fact that in all conditions in which much nervous wear and tear are represented there is an abundant discharge of phosphates represented. This fact has led to the popular belief that fish is a typical brain-food. The idea has arisen from the fact that fish contains a fair amount of phosphates. But, then, beef contains, I should say, an equal amount, and the question of the suitability of one food over another is one which must be settled by other than purely chemical considerations. We may recall to mind Mark Twain's remark, made to the person who said he was confining himself to an exclusively fish dietary in order to promote and encourage his brain development. "You would require to eat a whale" was the witty rejoinder, and although a whale is not a fish, the point of the reply is not affected by the zoological anomaly. It is the same in the matter of fresh air and of other health conditions. One may say that there is nothing special in the way of brain-food to be taken, other than that which is included in a healthy and well-ordered diet that is capable of supplying the wants of the body at large. I have no faith in the special nostrums of people who, relying on a solitary fact in brain-com-

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position, select that fact as the basis of a theory that a particular food, and that alone, can supply the wants of the organ of mind. I should rather say that the true statement of matters lies in the direction of the remark that the food which will perfectly nourish the body at large will of necessity contain the elements the various systems demand.

There are, however, a few rules regarding the food for the nervous system which it may be worth our while to consider. For instance, brain workers will require less food than those who are employed in occupations involving hard manual labour. The food which suits a navvy perfectly, will not be adapted for a barrister or a doctor. The former has a robust digestion capable of assimilating the coarsest of fare ; the latter has a much more delicate digestion, and demands his food in a form in which it may be most readily assimilated. This latter point is all-important, apart from the mere quantity of the food required. If the brain worker takes fish—white boiled fish for preference—alternatively with meat, he may be doing himself a physical favour. This result accrues, not because the fish is more nutritious than meat, but because it provides

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a variety in food, and because it is more readily assimilated than the meat. Sir Henry Thompson puts the case admirably in his "Food and Feeding," where he discusses the idea that fish contains certain elements which adapt it in an especial manner to renovate the brain, and so to support mental labour. Sir Henry says: "There is no foundation whatever for this view; the value of fish to the brain worker is due simply to the fact already referred to, viz., that it contains, in smaller proportion than meat, those materials which, taken abundantly, demand more physical labour for their complete consumption, and which without this, produce an unhealthy condition of body, more or less incompatible with the easy and active exercise of the functions of the brain." So that a first point here might be said to be included in the assertion that the brain worker, and therefore the nervously-constituted person, demands food which shall be readily assimilated. Digestion involves the expenditure of a great deal of nervous energy, and in the work of repairing our frames we illustrate the "robbing Peter to pay Paul" system. In the very act of taking in its coal and water, the human engine

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has to expend force. The need for foods which can be readily converted for the body's needs into the body's self, is therefore demonstrated.

A food which has always ranked very high as one particularly suited for the nutrition of the nervous system is fat. Dr Weir Mitchell lays great stress on the importance of fat in nervous troubles in so far as the dietary is concerned, for fat itself is a prominent constituent of nerve tissue. The modern repugnance to fat is difficult to understand. No dietary can be complete or adequate in the absence of a due proportion of fat. Even when the ordinary requirements of the body are considered, the welfare of the nervous system is largely dependent on that element being supplied to it. Fat, of course, may be presented to us in many different forms. From milk, butter, meat, eggs, and so forth, we obtain our due allowance, and if there is a demand for increased nutrition on the part of nervous subjects—especially in winter, when the external cold has to be faced and when a poor circulation demands additional reinforcement—I would advise that cod-liver oil in the form of a well-made emulsion should

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be taken. The emulsion-form of this excellent fat-food does not "repeat," as the ordinary oil is apt to do. Many a shivering, nervous subject who dreads the winter may thus be fortified against the vicissitudes of the inclement season of the year. The objection to taking fat on the part of many persons is found in the idea that it is unsuited for so-called "bilious" subjects, and that it tends to promote biliousness and liver troubles. Even in the case of those who are not necessarily thus affected I think this idea is founded on a mistake. My late friend, Dr Milner Fothergill, who was probably the first physician to specialise food and dietetic questions, lays great stress on the fact that many "livery" people can assimilate fat with the utmost ease and advantage. In any case the practice of adding fat to the food in sufficient degree is worth trying. I should, therefore, advise all nervous people to see to it that a sufficiency of fat—I do not imply excess in any sense—is represented in their diet.

Another important consideration connected with the food of the nervous person is that which insists upon his taking a due proportion of nitrogenous food. By nitrogenous foods

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we mean to imply those which contain the element nitrogen. The presence or absence of this element makes all the difference in the world to the character of a food. Thus white of egg, juice of meat, curd of milk, and like foods represent the nitrogenous class. They differ from those which do not contain nitrogen, this latter class being represented by fats and starches and sugars. The functions of the nitrogenous foods are chiefly to build up our tissues. They represent, in other words, the iron, brass, and steel of the human engine. The non-nitrogenous foods, on the other hand, of which fat is a characteristic example, are force or energy producers, as we have already seen. It is quite clear, therefore, that for the proper constitution of the nervous system nitrogenous food is a necessity. It is true that the quantity of nitrogenous food we take each day bears a relatively small proportion to the quantity of non-nitrogenous material we consume. The proportion in the ordinary working dietary would be about one of nitrogenous to four and a half of non-nitrogenous material. The engine, to return to our comparison, does not require renewal of its iron, brass, and steel in the same proportion that it demands re-



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plenishing of its coal and water. We obtain our nitrogen supply from the sources I have already indicated. All ordinary foods contain a certain proportion of nitrogenous elements. No doubt we draw our chief supplies from the butcher and the fishmonger, and, despite the opinions of our vegetarian friends, ordinary humanity, in the temperate regions of the world at least, will continue to regard the supplies of the butcher and the fishmonger as essential for our due nutrition.

There is, however, a marked distinction to be drawn betwixt the elements which, say, a piece of beef is found to contain. Thus the beef, in addition to a certain amount of water, minerals, and fat, contains nitrogenous matters in the shape of albumen, muscle-juice, and the like, while it also contains certain bodies known as "extractives." One very great dietetic mistake which nervous people and invalids are apt to make in respect of their food arrangements is that of supposing that the beef extracts and like preparations, now so largely sold, represent in the fullest possible manner the beef from which they were derived. As a matter of fact they consist almost entirely of those materials I have called "extractives."

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When the physiologist investigates the action of these latter substances in the body he discovers that they are purely of the nature of stimulants. In other words, they contribute nothing to the body's upkeep, but simply represent not the fuel of the fire, but oil thrown upon the flames in order to produce increased and more rapid combustion. I lay stress on this important fact because a vast number of people consume such substances with the idea that they are true foods. In this way they are paying for that which is only a stimulant, and in addition to lacking definite nourishment they are practically wasting their money. By way of guiding my readers definitely in this all-important matter, I do not hesitate to say that there is one food of concentrated form which may be relied upon both as a stimulant and as a nutrient. This is "Bovril," which stands out conspicuously amongst a crowd of meat preparations as a true food. Analysis of this substance shows us that it contains a high proportion of nitrogenous elements in addition to extractives, which represent the stimulant side of the meat. I have had the personal testimony of medical friends to the fact that "Bovril" possesses

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admirable nutritive qualities, and is therefore well fitted not merely to serve as a food but likewise, in nervous subjects especially, to act as an agreeable tonic. The ordinary beef extract, being a stimulant alone, may be added to soups for the purpose of increasing their value in the direction indicated; but in "Bovril" we possess the means of at once making that which is a true soup or solution of beef, requiring no additions whatever to render it both nutritive and palatable.

I come now to consider a topic of high importance to our welfare in modern life in so far as the nervous system is concerned. I allude to the question of the place, use, and power of alcohol in our ordinary existence. A difficult question this, no doubt, and one which is capable of being argued out from very divers points of view. I am concerned here not so much with the moral or social aspects of the alcohol question as with the action of that substance upon the body in a normal state.

Let me begin by noting what even educated people often appear to require to be reminded of, namely, that alcoholic beverages vary materially in their strength. I may go further, and say that the alcohols found in certain wines,

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for example, differ materially in character from those contained in other wines or liquors. The proportion of absolute alcohol contained in ordinary beer, for example, will amount to about five per cent., that in clarets and burgundies to from ten to twenty per cent., in sherries, which are mostly fortified wines, to about twenty-five per cent., while the stronger liquors (whisky, brandy, gin, etc.) contain about fifty per cent. We must therefore bear these facts in mind, for the plain reason that if the question of the amount of alcohol arises in our considerations we have to take into account the special form in which the alcohol is consumed.

No question can arise of the evil effects of alcoholic excess. It acts as a subtle poison attacking the nervous system especially, and also inflicting grievous injury on the liver and other organs. It breaks down that self-control which is the glory of the civilised man, and abolishes the power of inhibition that represents the fullest outcome of our will enabling us to guide our lives aright. These things are matters of no dispute, but there lies beyond them the chief question, which is a purely scientific one, of the effects of alcohol

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on the healthy body. I may premise that scientific men do not appear to be wholly agreed concerning the exact place which alcohol may be said to hold in the list of substances consumed by man. Some regard it as a food, poor in quality, very expensive, but still capable of contributing to the income of the body. Others deny to alcohol the rank of a food at all. They regard it as, at most, an adjunct to foods, and I rank myself with these who incline to favour this latter opinion. By a food adjunct one means a substance which, while not contributing in itself to the body's nourishment, possesses certain qualities which in one way or another enable it to affect the digestion, assimilation, or perhaps the nutritive value of true foods. Tea and coffee are adjuncts of this kind, as I shall hereafter show, and in placing alcohol scientifically in the same category as these beverages, I think we are standing on fairly safe ground. Again, the exact manner in which alcohol is disposed of by the living body is still a moot point in science. The old views estimated that the kidneys eliminated the alcohol as such from the blood. Taken in excess, so much of the alcohol may be thus disposed of, but that this

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is not the normal manner of its utilisation by the body when taken in moderate quantity is certain. Therefore the whole subject of alcohol is one involving extreme difficulties in the way of a scientific settlement, and it is well that ardent temperance reformers, who regard alcohol as a poison and a poison only, should bear this important fact in mind.

The relations of alcohol to the nervous system I have already stated are of the most intimate description. It is a curious and noteworthy fact that there is not a nation on the surface of the globe which has not invented or discovered some form or other of intoxicant. Even the most primitive people have contrived to produce alcohol, which they use very much as alcohol has always been employed, for the purpose of gladdening the heart of man. A reference to the Old Testament will at once show how ancient is the belief in the cheering influence of alcohol, and the patriarchs themselves evidently made acquaintance also with its intoxicating properties. Many a person, dull and depressed, has felt a new man after a good dinner and a glass of wine, and an agent which is capable of accomplishing this desirable effect in social life, is neither to be lightly

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estimated nor to be regarded as other than an important item in all considerations with reference to the health of the nervous system.

Certain experiments made by Hammond of New York would appear to indicate that alcohol has a certain power of either replacing a lack of food or of making an imperfect food-supply more or less adequate to the wants of the body. The properly fed man benefited nothing from the addition of alcohol; when underfed, his weight decreased; but if in the underfed state alcohol was added to his diet, the weight in that case returned to the normal. This result, as I have indicated, may be due, not to the fact that alcohol is a food in itself, but that it has a power of spinning out, as it were, the nutritive properties of the food, or it may be of limiting the waste of the body, and in that case also enabling the imperfect supply of food to be very fully utilised. Assuming these views, then, to represent a fair statement of what alcohol is capable of effecting in the normal body, the question still remains concerning the amount of this substance which may be taken daily by the healthy man without injury to his health.

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The experiments of the late Dr E. Parkes, the famous authority on hygiene, have never been questioned with regard to their accuracy, and founding our belief on these experiments it may be held that the healthy man may consume per day, without harm, about one and a half ounces of absolute alcohol. When this quantity is exceeded there are effects produced which lie outside the domain of the normal life.

That which concerns us, then, is to discover the place of alcohol in our social life, having special regard to the nervous system as one of the ruling factors of our existence. The teachings concerning alcohol, which for the last twenty years I have been accustomed to set forth, are comprised in three propositions. First, alcohol is absolutely injurious to the young; and of that fact I do not think any doubt whatever can be entertained. It has a power of arresting nutrition. Dog-breeders are aware of this fact, and utilise it in the production of their toy dogs, and the gin-fed baby of the slums is a proof from the human domain of a like effect. Second, alcohol is not a necessity for the healthy body. Of this truth we have, of course, ample de-



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monstration. Thousands of persons neither take nor require alcohol, and maintain themselves without its aid in perfect health. Third, the true use of alcohol in modern existence, in my opinion, is to serve as an aid in our dietetic arrangements, by which statement I mean to imply that it serves as a food-adjunct, and may, on the evidence I have adduced, be regarded as materially assisting in many cases the proper assimilation of our nutriment.

Let me take a case in point. There is no more frequent or more distressing ailment which can affect the nervous subject and the ordinary individual alike than dyspepsia, or in plain language, "indigestion." This is a hydra-headed ailment in so far as its causes are concerned, and these causes range from defective teeth on the one hand, to want of tone in the stomach arrangements on the other. Now in many cases in which there is a lack of digestive power, and where discomfort after eating is experienced, the addition of a little alcohol to the food is found either to cure these symptoms or to relieve them very materially. It probably may effect this result through its action in stimulating the stomach and its glands to their work, or

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it may possibly exert some other action less definite but equally certain when we appeal to the lessons of experience. This, I repeat, is the dietetic value of alcohol taken in moderation. I have been more than once taken severely to task by friends who are total abstainers for what they are pleased to call my advocacy of "the common drinking habits of the country." I have always strenuously objected to being misunderstood, and this, I take it, is a feature by no means peculiar to me as an individual. "The common drinking habits of this and other countries" are represented by the taking of alcohol at all times, at all seasons, and under all circumstances. It is, I admit, a grievous and senseless practice, that the common meetings of the marketplace, so to speak, must be celebrated and details of business clenched by the consumption of alcohol. This represents another phase of the far-reaching influence of the alcohol question in social life. I do not defend these practices, and if less alcohol were consumed all round, the nation would be healthier and wealthier as well. But when my abstaining friends go the length of declaring that under no circumstances whatever is alcohol cal-

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culated to produce any good effect on the human organism, I join issue with them and decline further discussion until they have mastered the facts of the case.

Alcohol in its influence on the nervous system must be regarded as an agent of great power. There is a term, namely, the word "neurotic," which is a useful phrase, implying what in plain language one may call a highly nervous strain in a person's constitution. The highly nervous person would thus be termed a "neurotic," just as we might include an epileptic subject in the same general category. Perhaps, more properly considered, we might define a neurotic person as one whose nervous system is in an unstable state. It is liable to be more readily put off its balance than the system of another and more soundly constituted person. Now on neurotic individuals alcohol exerts its power with tremendous force. The quantity of alcohol which more stable and phlegmatic temperaments could consume, with apparently a large degree of impunity, would entirely upset the neurotic individual, and if the latter continued his potations we should expect to find in due course a complete nervous breakdown.

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I suspect a great deal of the injury in our social life which may be traced to the effects of alcohol is due to the form in which alcoholic beverages are consumed. We hear perpetually of there being less drunkenness abroad than with ourselves, and this is probably true on the whole. One reason for our increased liability in the direction of alcoholism may be found in the fact that we consume ardent spirits to an extent uncommon in the South. We not only therefore consume probably more alcohol absolutely, but we take it in a form concentrated enough to affect our nervous system in a very marked manner. If in Britain we could substitute light wines and beers for the stronger potations in which we indulge, the question of temperance reform, I am convinced, would be largely solved.

The lesson we learn regarding alcohol is obvious. It may be a good servant for the nervous man and his opposite alike, but it is not only for the former a bad master but a despotic tyrant, whose influence in breaking down not merely his moral sense but also in inflicting physical injury upon him is paramount. I should say that the strictest possible temperance, and for the neurotic

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person even absolute abstinence, should represent the rule of healthy life.

Other food adjuncts are tea and coffee; these represent a feature of interest from a dietetic point of view, as also does the question relating to cocoa as a food. No doubt whatever exists that tea and coffee are stimulants alone. They are not foods in any sense whatever. They may be compared in their nature to the beef extracts we have already discussed. They add nothing to the body's substance, and are therefore to be regarded as food-adjuncts, exercising an action of stimulant kind without contributing to the body's wants in the way of tissue or indeed of actual force-production.

The active principles of tea and coffee are theine and caffein. These, of course, are virtually powerful poisons, but taken in the minute proportions in which we obtain them in tea and coffee they act as nerve stimulants. The well-known line concerning "the cup that cheers but not inebriates" implies very fairly the action of tea and coffee, although of course the power of cheering may be separated by a very thin line indeed from the phenomena of inebriation, physiologically

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regarded. Coffee is by far the stronger of the two, in respect that caffein has a more definite action apparently on the nerve centres than theine, and, as most of my readers are possibly aware, caffein is now employed as a drug calculated to give relief in certain varieties of nervous headache. The habit of consuming tea and coffee may find justification in the sense that we introduce in this way so much of the water which is required for the body's constitution, and therefore as a pure beverage tea or coffee need not be adversely criticised.

I am, however, convinced that a large number of persons, and not necessarily those of neurotic type alone, habitually consume far too much tea and coffee. From my own personal observance I am convinced that one might legitimately enough speak of certain persons as tea drunkards as one speaks of the ordinary wine-bibber. Taken in excess, tea and coffee have a direct action on the nerve centres. If we wish for demonstrations of this fact in a plain way, we might find it in the practice of many persons who, requiring to keep awake, take coffee with that object in view. Excess in tea and coffee drinking, I should say, lies at the

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root not merely of a vast number of so-called nervous troubles, but also of the dyspepsia from which so many persons, and especially women, suffer. The American poet who wrote of the "eternal teapot simmering on the hob," described a fashion and custom not limited by any means to the other side of the Atlantic, and one important piece of advice I should therefore reiterate to the nervous man or woman is to limit the amount of tea and coffee consumed. I may add that, in the opinion of certain physicians, excess of coffee leads to the development not merely of nervous troubles, but deranges the sight, and exerts also a baneful effect on the action of the heart.

The true place of tea or coffee, like that of alcohol, being an adjunct to food, it can now be understood that the only people in this world who are entitled physiologically to consume these beverages are those who have plenty of other food to eat. The spectacle of a working-class girl having tea for breakfast, tea for dinner, and tea for tea, represents to my mind a grievous physiological and social wrong. If she is underpaid and cannot afford true food, the enormity represented in her under-nutrition, with its anæmia

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and other ailments, must rest on the shoulders of those who employ her. But I could find her a way out of her difficulty even without bullying the niggardly employer who does not pay her "a living wage." Cocoa is a true food, and in this statement lies the solution of this grave food problem for the masses. The error of ranking cocoa with tea and coffee is as common as it is baneful. When we analyse cocoa we find it to be a perfect natural food. Analysis teaches us that it contains a fair proportion of nitrogenous matter in the shape of gluten, a very large proportion of fat, the value of which I have already demonstrated, a considerable amount of starch, so much mineral matter, and, finally, a stimulant of its own called theobromine. I have in my health-teachings compared cocoa to a vegetable egg, and as the egg contains everything necessary for the building of an animal body: hence its popularity in culinary operations. Cocoa and the egg must each be regarded as a perfect food.

I have persistently in my public-health teachings advocated the substitution of cocoa for tea and coffee on the part of the



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masses of this country, and this teaching applies also essentially to the nervous person. Over-stimulation with tea and coffee can be avoided by replacing these beverages with cocoa, and the nervous person will benefit by the substitution. He will be obtaining not merely a fair amount of nutrition from the cocoa, but he will be receiving in the cocoa an amount of the fat necessary for his welfare which he will not obtain from any other food. There is one point, however, to which I should wish to direct my readers' attention: I have often heard people remark that they cannot digest cocoa, and that cocoa to them is distasteful. In such cases I have strenuously advised them to choose another brand of cocoa than that to which they object, but I have also added the very important advice to be quite certain that the cocoa they use is a pure article unadulterated by any addition of extraneous, unnecessary, and, in some cases, hurtful drugs. The cocoa I have for years recommended as a perfect food is "Fry's Pure Concentrated Cocoa," and there can be no more admirable example of an easily digested and highly nutritious article of diet.

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I strongly advise my readers to give the go-by to all cocoas which admittedly contain substances added to them, such as hops, kola, and like articles. A pure cocoa, like good wine, needs "no bush" of this description, and the continual use of such substances as kola and other stimulants is a practice entirely inconsistent with the preservation of the health of the nervous system.

The question of tobacco in relation to the nervous system, while not so important as that which concerns alcohol, is at the same time of a highly interesting character. Since the days when King James (of pious and pedantic memory) issued his famous "Counterblast" against the use of the fragrant weed, there have been repetitions of that production on the part of anti-tobacco societies and other organizations, which chiefly seem to exist for the purpose of preventing other people from doing as they please in a rational way, and of enjoying the good gifts which Nature has provided for the use of man. That tobacco is an important factor in our social life cannot be denied. Like alcohol, tobacco possesses an eminently social side, and the man who smokes and enjoys his pipe or cigar, is, all

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things considered, perhaps a more amiable animal than one who has renounced what he is pleased to call these vanities of the flesh.

Tobacco, however, stands socially on a different platform from alcohol. No man is ever likely by excess in smoking to reduce himself below the level of the beasts. It is true he may induce a state which, if not actually one of disease, at least approaches closely thereto, but he does not unhinge his mind, and his self-control is in no great peril of being modified or lost. Tobacco, regarded from the purely scientific point of view, is of course a sedative—that is to say, it has a narcotic, or, to put it perhaps more correctly, a soothing influence. Pushed to extremes, this sedative action might induce a condition akin to paralysis, but this latter result is rarely seen even in a smoker whose pipe or cigar is his constant companion through the whole length of a long day.

Knowing tobacco to possess a sedative action, one might well be inclined to regard it as in many cases a valuable aid towards maintaining our nervous balance. The term “pipe of peace” includes in itself a distinctive meaning in that it associates tobacco with

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the production of a contented frame of mind. The man who, perhaps worried and annoyed, seeks his pipe as his solace, induces in himself a mental phase in which he may be able to regard his worries and difficulties with a more philosophic eye than before. In the rush of modern life, where the tendency is to develop the neurotic constitution, tobacco may be regarded, in my opinion, as a kind of saving clause in the history of the modern man. Its soothing action on the nervous system is not necessarily accompanied by a large amount of depression, and the German savant who alleged that a glass of grog was the natural accompaniment to a pipe because the alcohol acted as a complement to the tobacco, may have found his excuse for the remark in the popular custom, even while the association in question is by no means invariable.

There can be no doubt, I think, that on the whole tobacco represents a harmless form of enjoyment to those who use it in moderation and with whom it agrees. I have said that tobacco is injurious to the young, as also is alcohol, and I should not hesitate to affirm that the prevalent practice of cigarette

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smoking by boys may lie at the root of a considerable deal of ill-health, dependent on the fact that tobacco acts in youth by checking the due nutrition of the frame.

The adult, on the other hand, may smoke through a long lifetime, and not merely enjoy his pipe, but experience benefit therefrom. Where tobacco acts injuriously on the nervous system we find either a special predisposition on the part of the subject which unfits him to consume tobacco, or we discover him to be using it in excess. In the first case, the man should be the judge of his own requirements in the way of tobacco consumption. If the weed interferes with his health or comfort, he will be acting only a common-sense part by renouncing its use altogether. There is in this case no middle course. Certain individuals are peculiarly susceptible to the action of some drugs and foods. It is known, for example, that certain persons cannot touch eggs without exhibiting symptoms allied to those of food poisoning, and a like result follows in other cases when mutton is eaten, or when even strawberries or certain kinds of shell-fish are consumed. We learn here an important lesson which lies at the

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root of all sensible practice in the observation of the laws of personal health. This lesson teaches us the relative nature of all our bodily and personal likes, dislikes, aptitudes, and tastes. This fact was well summed up by the inventor of the familiar phrase, "One man's meat, another man's poison." Tobacco, therefore, is no exception to the rule, and whilst for the vast majority of men smoking presents itself as a habit which has for its outcome the production of a soothing and calming influence, there are individuals upon whom it acts either with poisonous effect, or at least may be productive of injury.

Turning next to the question of excess in tobacco, we see the same relativity of things. One man may smoke without harm an amount of tobacco which would prove absolutely injurious to his neighbour, and there can therefore be no fixed law or rule for our guidance here save the personal equation, by which I mean the careful individual examination of one's limits respecting this and all other habits. It is the neglect of this plain teaching which serves to multiply the number not only of sets and societies, but of individuals who deem it their province to reform the world

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according to their own special, and often narrow, views of life. The effects of tobacco when taken in excess on the nervous system are manifested in various ways. There is first disturbance of digestion, then eye symptoms may be prevalent, ending in temporary loss of sight or tobacco amaurosis, as it is professionally termed. The further action of tobacco is seen in irregularity of the action of the heart, producing what medical men call "smoker's heart." The pulse is irregular and the heart's action enfeebled, with the result that the general nutrition of the body becomes in due time affected. Irritability of the nervous system due to the depression induced by the excess will also appear, and the otherwise beneficial effect of tobacco is thus converted into a positive evil. The remedy for this state of matters is of course obvious. The doctor will advise complete renunciation of tobacco, he will probably order tonics, and if the individual is completely run down, change of air will likely also be prescribed.

I may here refer to one phase of the tobacco question which of late years has come prominently into view. I allude to the habit

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of cigarette smoking at large, and to the indulgence by women of this form of enjoyment. The cigarette is no doubt a convenient and handy method of enjoying a whiff; but it is an insidious form of tobacco-smoking, seeing that the consumption of cigarettes by the ordinary smoker per day tends, as regards the amount of tobacco and the effects thereby induced, to exceed both phases as witnessed in the average man who smokes pipe or cigar. There are many men who appear to smoke cigarettes from morning to night, and even the dinner-table is not sacred from tobacco fumes. In addition to the danger of excess thus induced, we have to take into consideration the facts of inhaling the fumes of the paper, and the results of this feature of cigarette smoking on the throat. My contention is that there is greater danger of injurious excess in the matter of the cigarette habit than where tobacco is consumed in pipe or cigars.

On women, one may well be convinced the effects of tobacco, like those of alcohol, are much more easily produced than in men. The woman's nervous system is, speaking generally, of a more highly strung character



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than that of the man. She is more active in thought, more intuitive, more keen in her perceptions, than her lord and master, and, physiologically speaking, her nervous system is therefore more liable to develop the unstable state. In the matter of alcohol it is a familiar but lamentable fact that the woman's nervous system has less power of resistance than that of the man, hence, excess in this respect in the woman is rarely attended by reform. I believe that to the woman who drinks to excess, the loss of her own self-respect means so much more to her than it does to the average man, that she feels her reinstatement socially is an impossibility, and the despair which ensues simply hands her over as a prey to the full gratification of her debased tastes. With tobacco there is not the same danger by any means of lapse from the moral side of things, but tobacco will induce in the woman its particular effects in a more intensified manner, and much more quickly than in man. Cigarette smoking by women may physiologically not be condemned, whatever society manners or the canons of good taste may have to say to the practice, but medical men know of irritable

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hearts and like symptoms being the inevitable results of even moderate indulgence in tobacco by many women. Argument here seems to lie in the direction of advising women to be more than careful of the tobacco habit. It is a feature of their nervous constitution that the effects engendered in them are of a much more decided character than in the opposite sex.

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## CHAPTER V

### INHERITANCE, THE WILL POWER, MESMERISM, AND GHOST-SEEING

ONE extremely important condition in so far, not merely as the health of the nervous system is concerned but also the welfare of the whole body, is that summed up in the words "Heredity" or "Inheritance." By this phrase is meant that we inherit from our ancestors not merely the particular form and features which they displayed, but also the mental characteristics wherewith they were endowed. Each person is the concentrated essence not of his own immediate parents, but of his grandparents, his great-grandparents, and of an ever-increasing array of ancestral forms. It is quite obvious that we do not enter this world as absolutely clean slates on which the world may inscribe anything it pleases. We are influenced largely by the world no doubt, but as the world modifies us, so the influence of

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our surroundings is in turn modified by our own constitution. Heredity is responsible for the vast bulk of that constitution, and heredity is equally responsible for much of the character each of us exhibits from a mental point of view.

The man who inherits from his ancestry a sound body and a sound mind obviously starts life with an advantage not possessed by his neighbour who has descended from a stock in which the "sins of blood" of the poet have been markedly represented, and I need hardly add that there is no system included in our personal belongings which is more liable to exhibit the effects of inheritance than our nerve apparatus. This result may be readily understood when we reflect that our nervous system is really the means whereby we receive impressions from the outer world, and also whereby we are enabled to re-act upon our surroundings, therefore we may regard our nervous system as a portion of our anatomy singularly liable to be modified by our inheritance and by the daily existence we live. These latter modifications in turn may be handed on to those who succeed us in the direct line of blood relationship.

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The nervous system must appear to each of us as an apparatus singularly connected with all problems of inheritance. It is well known, for example, that certain traits, phases of mind, tricks and manners, are transmitted from parent to offspring in the most direct fashion, and also that diseases of the nervous system may with great facility be handed on from parent to child. There may be some doubt in the case of certain diseases whether these ailments themselves may be actually inherited. Thus when we speak of consumption being handed on from parent to child, it is probable we should rather talk of the tendency of the disease being transmitted. The child, in other words, is not born with the germs of consumption latent in its lungs and ready to develop the fell disorder of which they are the cause; that which the child inherits is a weakly condition of lung (or body) that renders its frame a more likely soil for the growth or development of the germs than the lungs and body of the child born of healthy parents. But in the matter of nervous disorders there appears to be a singularly direct transmission of abnormal conditions. Thus the chances that

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the child born of parents afflicted with epilepsy will develop that disease are very great indeed. So also it is highly probable that the neurotic individual has inherited his mental peculiarities directly from his ancestors ; and it is a generally recognised fact that from an insane stock will be brought a progeny which either exhibits the insane temperament, or which shows a singular liability to develop towards the insane side.

It is clear, therefore, in considering the social aspect of the nervous system we have to reckon with the great problem of "like begetting like." This has been for some time past in science a much debated question—whether acquired conditions or characters can be transmitted to the offspring. One section of the scientific world strenuously denies the possibility of any such transmission ; they argue that it is only the minute, imperceptible variations which accumulate by degrees in the living organism that work out change in its history. The opposing school of thought maintains that characters acquired by the parent in his own life history may be handed on to the offspring. They do not argue that every character so acquired (such

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as an accidental mutilation), will be necessarily reproduced, but they at least contend for the possibility of such transmission of parental characteristics.

Personally I regard the opinions of the second school of thought as containing at least a larger measure of probability than those held by the first-named section of thinkers. I think it is provable, in respect of the nervous system at least, that many acquired habits are capable of being reproduced. Darwin gives a remarkable case in point. He tells us of a gentleman who when an infant was observed while lying in his cradle to raise his hand above his head, clench his fist and bring it down forcibly on the bridge of his infantile nose. The result was that the nose became enlarged and swollen. To this gentleman was born in due course a child who as an infant was observed to repeat the curious action of the father with the modification that instead of bringing the clenched fist down on its nose it brought the open palm in contact with that organ. How we are to account for this direct transmission of an apparently accidental habit unless on the view that an acquired or spontaneous character can be

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handed on, I fail to see. Of course much will depend on what we regard as an acquired habit, but it appears to me that unless we admit this possibility we may altogether fail to account for the effects on the young of education, of new surroundings, and of the thousand and one other influences which are brought to bear upon them and by means of which their characters are formed and modified.

The part played by inheritance in respect of our nervous constitution being thus noted to be of singularly direct even if of a complicated nature, we may admit that the influence of education and training in respect of the nervous system must form a topic of the highest importance to us all.

If the child be born of neurotic parents it is obviously their duty to see that his physical training and his education are conducted on lines tending to repress the special features through the operation of which his nervous instability arises. Thus a neurotic child should in the first place be well and carefully fed. He must be brought up in a pure atmosphere, removed from all influences which would tend to unduly exert his nerve centres. He must of all things be prevented from any tendency



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to brain-forcing, and it might be well, in such a case, if his education were begun at a later period than that at which the training of the average healthy child commences. His physical powers must of all things be fostered and encouraged even if at the expense of the brain lying fallow for a time. This care will likely result in the development of a healthy after-life in opposition to the result certain to follow where an unstable brain is being unduly taxed. The same remarks apply to the up-bringing of children derived from any stock which is to be regarded as being mentally more unstable than that which produces a merely neurotic unit. It is a question this of close observance of all the laws of health, whereby not so much the equal balance of brain and body is secured, but where actually the bodily powers must be encouraged to the physiological neglect for a time of the powers of the mind.

If acquired characters and the impressing on the body of a distinct mode of life favourable to its welfare be not capable of being handed on in turn to ensuing generations, then all the results of our culture of health science and all its practical applications to the ordering of human life must be of non-effect. But

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happily experience falsifies this conclusion. We know as Sir John Simon long ago pointed out that any slight improvement in the health of each generation is transmitted onwards with an ever-increasing effect to the generations to come. In other words, improvement in health increases not in arithmetical but in geometrical ratio.

In connection with the development of the powers of the nervous system, we naturally come to consider an interesting topic in connection with will power. There is probably no more interesting subject falling within the province of the scientific investigator or of the social philosopher. By will power may be taken to mean the collective results of an individual's voluntary aspirations towards the performance of any given work. The difference between one individual and another in respect of character may be largely summed up by referring to the variations they exhibit in the development of this faculty. The determination and perseverance which characterise one man, is opposed to the weak, vacillating temperament of another; and differences of the most supreme kind between individuals are really due to the variation in

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the development of will power exhibited in the two cases. The one man exemplifies the case of a nervous system which, having complete control of the body, exercises that control in the most direct fashion and makes the body the willing and obedient servant of the brain. The other case exemplifies that of a brain whose measure of control over the body is of extremely weak and uncertain character, and as a consequence the actions of the second individual are not marked by the promptitude, exactness, and decision which characterise those of his neighbour.

The difficulty of the development of will power is of course obvious. The men who rule the world are practically those who have developed this power to the fullest extent. They have overcome obstacles, beaten down opposition, and forced their personalities and opinions to the front. It is remarkable, however, that occasionally we may find an individual, by no means of a robust habit of body, who nevertheless illustrates in a marvellous degree the high development of the power we are discussing. It is, therefore, more peculiarly an attribute or property of the nerve apparatus. The body, healthy or

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weak, is dominated in such a case by the nerve apparatus to an extent unrepresented in cases where the will power is deficient. This development may in some cases proceed to extraordinary limits. It may occasionally be exerted even to check actions or processes in the body which otherwise would tend to bring about disastrous results to the body's welfare. I remember years ago reading of the case of Edward Irving, the famous preacher. It was during a cholera period when Irving was seized suddenly with symptoms which were undoubtedly those of the dreaded disorder. He was about to ascend his pulpit, and in the vestry was well nigh in a state of collapse. Summoning to his aid his will power he resolved that, living or dying, he would enter the pulpit and discharge his duties. Tottering into the pulpit, he began the service and after a period in which he was obviously suffering intense pain, he gradually recovered, and although wearied and faint at the close of his ministrations, he had evidently shaken off the attack with which he was threatened. I see no reason to doubt the veracity of this recital. There are many cases in which a bold, resolute, and determined attitude, even

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towards disease, may enable us, if not to check the onset of an illness, at least to modify it in our favour. We see much the same result in cases in which an individual about to undergo a serious surgical operation looks upon his case with absolute cheerfulness, with a certainty born of a determination to believe in the best, that he will successfully pass through the ordeal. As a result his expectations will probably be verified, whereas the man who is unable, notwithstanding outside encouragement, to believe in his chances of recovery, and whose will power is not equal to inspiring him with hope, other things being equal, stands a poor chance of a satisfactory termination of his woes.

It is in connection with the subject of will power that the subject of blushing may be appropriately considered. In an earlier chapter I discussed the mechanism through which on the one hand the blood vessels are made to expand in consequence of mental emotion and through which conversely they are made to contract, producing respectively the phenomenon of blushing on the one hand and of paleing of the face on the other. The bashful man is again introduced to us in this connection, for we perceive very clearly that whatever

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may be the exact mechanism through which blushing is carried out, the development of this phase of nervous work is due to a lack of sufficient will power to prevent it. It is undeniable, of course, that blushing renders the subject thereof somewhat an object of compassion to other persons, for the mere fact that blushing may be readily induced, is in itself a sufficient reason why confusion would seem to overwhelm the luckless subject of this nervous phenomenon. It is not alone the man who is unaccustomed to mix in society who is liable to blush. Many individuals, otherwise composed, will blush on very slight provocation induced by the emotions we have studied, ranging from modesty on the one hand to anger on the other. There is no panacea or universal remedy for blushing. Where it becomes of a morbid character, and where an individual appears to exhibit this feature for everything and every course, I should say his state of health is responsible for his weakness, and in this view it may be regarded as a symptom of male hysteria which may demand change of air, tonics, and other familiar remedies for its cure. But the individual who is to be sympathised with is he

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who blushes under the ordinary circumstances of life and society through which his less sensitive brother passes unscathed. Now, apart from questions of health, it seems to me there can be no remedy for blushing, if such be required, other than the cultivation of a higher degree of will power than the individual appears to possess. This of course is precisely where his difficulties begin.

With a nervous system of another type all attempts to convert him from his weakness to strength may prove unavailable. But if, on the other hand, it be made clear to him he can succeed by the exercise of self-control in overcoming his weakness, this mental impression may prove the starting-point of better things in his social career. That which he must endeavour to do is to determine by his will power that he shall not cause himself to feel ridiculous whatever he may appear to other people, and as aids to this education of his will power may be prescribed a freer mixing in society, the cultivation of acquaintances, the frequenting of public assemblies, and in general the rubbing of shoulders and the exchange of ideas with his fellow-men. It is often found that the blushing habit is most

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typically developed in a man who is more or less of a recluse, who lives either by himself or very much to himself, and whose circle of acquaintances may be limited, or who may actually exhibit a morbid dislike to society at large. I do not here refer to those "flushings," as they may be called, rather than blushings which are indicative of some disordered state of the circulation. These are matters for the attention of the medical man. I here refer only to the case of the bashful man whose little failing practically illustrates his lack of will power to control his emotions.

The topic of will power also introduces us to a by-way of brain action, which is included under the title of "Mesmerism," or as the modern phrase runs, "Hypnotism." It is a topic which has been the subject of very considerable discussion, not merely amongst the medical profession, but on the part of the general public. Some years ago public attention was directed to a series of experiments carried out in Paris, and described under the title of "The new mesmerism." Some very extraordinary statements were made in connection with certain experiments alleged to have been carried out on the part of certain



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French mediums in conjunction with members of the Parisian medical faculty. I need not refer to these experiments further than merely to say that they were proved to be thoroughly fraudulent in their nature. The subjects of the experiments were accomplished deceivers of the first water, and the English investigator who made inquiries in Paris respecting the alleged wonders soon detected the frauds.

Mesmerism in consequence fell somewhat into disrepute, and I cannot say that at the present time it represents much more than scientifically a very curious phase of brain action. In order to understand what "hypnotism" means we must awaken to the fact that the brain consists of higher and lower centres. As I have pointed out the highest brain cells correspond to the Cabinet of the country, while those of minor degrees of importance might represent the Parliament with the subordinate officials, who carry on the routine work of government. We know also that in the brain there is an independence of its various parts admitting of the activity of one part while its neighbours may be in a more or less dormant and inactive condition. In sleep we perceive the result of the independence in

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question. Thus, while the conscious parts of the brain and those by means of which we carry on all the operations of the will are lulled into unconsciousness, we note how the lower centres may show their activity in the production of dreams or even in the rousing of the individual from his slumbers, causing him to exhibit the actions of the somnambulist or sleep-walker.

It is the recognition of this independence of brain centres on which the true explanation of mesmerism is based, and speaking generally it may be held that when a person passes into a hypnotic state he illustrates the condition of a man in whom the higher brain centres have been temporarily switched off, and in whom the lower brain centres are made to assume command of the body and to act under suggestions conveyed from the outsider. I have always compared such a man to a ship, the captain of which has been deposed from the quarter-deck and an ordinary seaman made to take his place. Mesmerism, moreover, is a condition which does not stand alone in the list of brain actions. When we can parallel any curious fact or phase it thereby loses much of its unusual or extraordinary character.

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The detached fact remains peculiar because it is not related to other facts, whereas when it is brought into such relation it falls into its due place in the category of scientific data. Mesmerism is one term in a series of connected brain actions. We begin with reverie, or state of abstraction, represented by the man who sits day-dreaming in front of his fire. This individual may show a deepening of the abstraction which very naturally lands him in the domain of sleep. If we now suppose that he is by the action of lower brain centres roused from sleep and made to execute the actions of the sleep-walker, we arrive at a third and further stage on the pathway that leads, by a connected series of acts, to mesmerism; for mesmerism itself, represents the fourth stage and may be likened, in a certain sense, to artificially induced sleep-walking. The mesmerised subject, when he is not placed in a state resembling sleep, is practically as automatic or machine-like in his actions as is the sleep-walker, with this difference, that while the latter is guided by suggestions or impressions proceeding from within, the hypnotised person is directed by suggestions coming from an outside source in the person of the operator.

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Explained in this way we see clearly how hypnotism is a state which involves the relinquishment of the will power, and the individual who is the subject of the hypnotiser's experiments literally becomes as clay in the hands of the potter. He will carry out more or less perfectly the commands and suggestions which the operator impresses upon him. He has resigned his entire personality for the time being into the hands of another. Proceeding to discuss how the hypnotic state may be induced and also the mental character of those in whom it is induced, we find that various methods may be employed to procure the temporary inhibition of the higher brain centres. Thus gazing fixedly on an object, whereby eye-strain is incurred, will give rise to the mesmeric condition. Similarly the repetition of a monotonous sound tiring out the ear may induce it. Again, in specially facile subjects, the sound of a gong or the flashing of a bright light in front of the eyes will throw them into the hypnotic state. Mere suggestion of the operator in favourable cases will also induce it, so that, given a particular type of mind, and an operator possessed of sufficient confidence and will

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power to impress his subject with an idea of his abilities, and we have all the conditions for producing a state of pure automatic obedience to outside suggestion. With regard to the subjects who are most easily influenced by the hypnotic process—in which it will be seen there is nothing mysterious or wonderful—I should say that the typical subjects would be, and are, imaginative, impressionable persons. Your hard-headed person with a fair development of will power is not impressed with the vapid “passes” of the mesmerist or with the suggestion that the operator can assume command of all his actions. We note also an illustration of this truth in the fact that those who have been frequently hypnotised are the most susceptible to the suggestions of the operator. It is in this respect like the river which, the longer it runs, makes its channel the deeper, and the effect of habit on the nervous system parallels the action of the running water.

The modern view taken of hypnotism by the medical profession I may fairly describe under the designation that it is a phase of brain action of greater interest to the physiologist than to the man of medicine. Enthu-

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siastic believers in hypnotism are impressed with the idea that it may constitute a veritable panacea for many of the ills which afflict humanity; but I think I am within bounds when I assert that physicians in this country at large are highly sceptical of the value of hypnotism as a curative agent. It may possibly be of service in inducing in weak-willed, facile persons ideas which may enable them to overcome or avoid some weakness to which they are subject. It has been alleged that the drink habit and the morphia habit may be cured by hypnotic influence, and that by the suggestions made while the individual is mesmerised, a distaste for these substances can be acquired. But even in the domain of habit we have yet to be provided with satisfactory proofs that the influence of hypnotism is likely to be of a permanent character as an agent in reform. The subject illustrates in the most apt fashion the influence of the will power. There is first the impressing of an idea or suggestion on the mind of a facile subject, and there is in the second instance the existence of the stronger will in the work of so impressing the idea.

Concurrently with this view of things arises

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the question of the moral side of this subject. I have always maintained that it is no light matter for any individual to resign his will into the hands of another, and to be what in the majority of instances the hypnotised individual is, a mere automatic puppet in the hands of the operator. Even the French school of hypnotism, whose extravagances have become notorious, has been compelled to take account of the moral side of the matter, and the question of the legal responsibility of a hypnotised person for the acts he or she may commit when under mesmeric influence has formed the subject of frequent debate in both medical and legal circles. It is eminently desirable therefore that all public exhibitions of hypnotism should be prohibited by law. They are so prohibited on the Continent because the authorities have recognized that in the case of the weak and imaginative, or of those in any way susceptible to these influences, there may be considerable danger involved in respect of the domination of their will by irresponsible persons.

The old theory that mesmerism was due to the emanation from the body of the operator of some mysterious force, to which amongst

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other terms the name of " animal magnetism " has been applied, finds of course no acceptance from the scientific world of to-day. The whole action merely consists in the switching off of certain brain centres and in the command of the body being assumed by those of lower nature. There is nothing in the whole course of mesmeric details which does not fall within the compass of brain-science, and where an explanation is not forthcoming from the scientific side it will be hopeless to expect it at the hands of the " professors," who on public platforms demonstrate the weakness of will of a certain section of mankind, and give exhibitions which, when they are not disgusting in character, represent the extreme height of folly.

I was once upon a time challenged by a friend to explain how it came to pass that a professional mesmerist visiting a certain town where he had conducted a week's entertainments on his own particular lines, should have been able to influence a youth a week after his departure in what apparently was a very marked fashion. The youth in question was told that a week after the professor's departure he would be compelled on a given



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day and at a given hour to present himself at the railway station and to wait there a given time in expectation of the professor's arrival. As the time approached the youth who was busily engaged at his work, became restless, and, despite the arguments of his friends, put on his coat, went to the station and waited for his mentor. So far from seeing anything especially wonderful in this recital the student of brain science can explain the occurrence by a reference to the operation of a fixed idea on the brain. Such an idea may assume possession of any man very much to his injury. Thus an individual may impress himself, despite all reasoning, with the most uncompromising idea of jealousy, and the "green-eyed monster" may take possession of him to an extent which dominates every action and makes him the irrational Othello of private life. It is a case of the "fixed idea" in ordinary life. Suppose now we transfer the origin of such an idea to the powerful suggestion of an individual assuming control of the will of a facile subject. We then are presented with all the materials for the working out of the comedy of the mesmerist. I can even go

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further and show how in the course of the brain's ordinary work and action we obtain a much more wonderful example of the fixed idea and its influence on our individual life. A person desires to awaken at a given hour in the morning, and at a much earlier time than he is accustomed to arise from his slumbers. He goes to bed having impressed himself with the idea of the extreme importance of, say, catching his train at the early hour. He falls asleep, but in due course awakens at or near the hour when he intended that he should be called. This phase I call the "stop-clock" action of the brain. It is as though one set one's brain cells to a particular hour and at the time in question they act automatically. How the brain can estimate the exact lapse of time may present an inexplicable problem. It is sufficient to assert that it is so, and that in a more wonderful manner than the fixed idea impressed by the mesmerist arrogates to itself the task of rousing the sleeping body.

Yet another phase of brain action, and one which disturbs certain persons in the calm tenour of their social life, is that which has reference to what one may call "ghost-

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seeing" or "spectral illusions." An "illusion" differs from a "hallucination." The illusion is known to be "a coinage of the brain" and the subject thereof knows it to be entirely fallacious. On the other hand, the hallucination is not so distinguished, and the illusion is believed to have the real and veritable outside existence. Let us suppose an individual asserts that he sees an image of his dead father seated in a chair at his bedside. Then in the event of his recognising that the so-called spectre has no outside or real existence, we say he is the subject of an illusion; but if he declares his belief in the reality of the appearance he sees, and despite all arguments to the contrary insists upon recognising this reality, we obtain an illustration of a hallucination. The borderland between sanity and insanity may even be indicated by some such distinction, even if it may not be completely defined thereby.

The explanation of ghost-seeing is one which depends on our recognising that there are two ways in which we may see "or hear" anything. There is first the natural method of seeing anything, which we term the objective mode. Here waves of light proceed from

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the actual "object" outside ourselves, pass into the eye, form an image on the retina, which in turn is transmitted to the brain, and there analysed out into sensations, the outcome of which is the consciousness of the thing we see. If we entertain any doubt regarding the reality of the object, the sense of touch may be used to confirm the judgment of our sight. Now let us suppose that by an active memory we can recall the form and appearance of the thing we have seen. This last is a pure act of recollection and that act is confined to our brain cells. But the brain possesses a power on occasion of projecting the memories of things seen, or it may be the memories of even our fancies from within itself outwards, and when such impressions are so projected on to the background of the eye they give rise to an idea of an outside object which has no existence. This is what we call the "subjective" mode of seeing anything, and the remarks applicable to the eye hold good also for the work of the ear.

Let us now imagine that the memory of our friend's deceased father is projected from the background of his consciousness forwards, he

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then becomes impressed with the idea that his father's image or spectre is seated in the chair at his bedside. A familiar instance of the same truth is afforded us by the drunkard who in his delirium fancies he sees snakes and rats. Also the ringing in our ears, or the flashes of light we see when the eye is irritated, are the spectres respectively of sound waves and light waves.

There have been many instances in which the lives of individuals have been made miserable by this faculty of subjective sight. Numerous cases are recorded in which individuals perfectly sane have on the other hand placed on record accurate accounts of the illusions by which they were troubled. There is the case of Nicolai of Berlin, whose spectres, crowds of which visited him and talked to him and to themselves, were dispersed after he was bled. There was the case of Mrs A., related by Brewster in his "Letters on Natural Magic," where an educated lady was troubled with visions of her husband, of animals, and of dead relations, due, as all these illusions are, to some brain irritation. They disappear when the cause of the irritation is removed, and the healthy tone of the brain

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is restored. There is also the case related by the Rev Dr Jessopp in the *Athenæum*, some years ago, where in Lord Orford's library at dead of night a figure dressed in the costume of a bygone age, appeared to him by the side of the table at which he was engaged in his writing. I suggested that this figure was probably that of some celebrity of the past with whose personality Dr Jessopp, as an antiquarian, must have been familiar. Mr Walter Rye identified Dr Jessopp's ghost; he pronounced it from Dr Jessopp's accurate description to be the replica of the portrait of the Jesuit Father Parsons, whose history Dr Jessopp had himself described in his book entitled "Four Generations of a Norfolk House." Doubtless Dr Jessopp's surroundings in the library had unconsciously suggested to his brain cells the illusion which he described so exactly.

The lesson taught us here respecting this prominent social phase of our nervous system and its work is that all the ghosts which trouble mankind are not "made in Germany," but are "manufactured on the premises." In other words, our spectres are things of our own creation, and are the pro-

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ducts of the memories stored up in our brain cells and galvanised, so to speak, into a semblance of reality through some unusual stimulation of these wonderful living units of our organ of mind.

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## CHAPTER VI

### SOME NERVOUS ILLS AND THEIR REMEDIES

**I**F the arguments I have used in the preceding pages of this work have been duly appreciated by my readers there will be no necessity to emphasise the high importance of preserving our nervous apparatus in a perfect state of health. We have seen that in the rush of modern life this system is singularly liable both to deterioration and to acquire irregularities in respect of the discharge of its duties. Having compared the nervous system to the government of the body, it is obvious that interference with its functions implies more or less disorganization of the frame at large. No further argument can therefore be required to bring into due prominence the duty of conserving our nervous powers.

I have no intention in this little book of trespassing in any way upon the domain which the doctor rightly regards as his own



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special province. When illness attacks us, our only safe course is that of consulting our physician, who, as a trained expert, is alone able to bring relief to our gates. Cases of nervous break-down causing the complete relinquishment of all the active duties of life are amongst the most difficult which the doctor can be called upon to consider, and one may well be convinced that many cases of nervous disorders become of serious character because they have been allowed to lapse through inattention, and because that aid which represents the "stitch in time" has not been forthcoming. One piece of advice which my readers should bear in mind is therefore found in the declaration that when brain-fag and nervous weariness begin to be apparent symptoms in the life of any individual, medical advice should be at once sought. Nerve troubles are peculiar as a rule in respect that they tend more rapidly than many other ailments to become chronic in nature—a declaration which is tantamount to saying that such cases, through neglect, may rapidly become incurable. Very simple measures may frequently suffice at the beginning of nerve trouble to relieve the sufferer ; change of air,

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relaxation of work, a complete holiday amid proper surroundings, the society of cheerful friends, an alteration in diet, or even a course of baths, aided by the attraction of a foreign spa, may represent the means of cure for the commencing troubles of the brain, when later on such simple hygienic measures might prove quite unavailable.

Of course many a man and woman may suffer from brain-fag in a minor degree without absolutely passing into the condition of the veritable invalid. Perhaps, like the over-driven steed which for a time easily recovers from the excess of work, the over-worked brain possesses a certain elasticity of constitution which quickly enables it to recover its tone. The danger, however, here is, that repeated attacks of brain-fag tend to permanently lower the vitality of the brain cells. In such a case the ordinary hygienic advice to attend to all those laws and conditions of health which represent the means of perfect living may apply. Thus if sleep be imperfectly represented, as is not at all unlikely to be the case, we must secure a fair modicum of rest. The question of sleeplessness, always prominent in nerve troubles, is too wide to

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permit of any discussion of it in these pages. The causes of sleeplessness are as varied as the characteristics of humanity themselves, but if a general irritability of the nervous system, due to over-work, or other cause, lies at the root of the trouble, then the subject may be able to effect a cure on hygienic principles. Thus, by shifting his camp to another sleeping apartment, by altering the hours of his meals, by the avoidance of tea and coffee late at night, by the taking of the old-fashioned "night-cap" (meaning thereby an alcoholic potion taken at bedtime), by the securing of perfect quiet and of a pure atmosphere, "the drowsy god" may be wooed back again to our domain. I should strongly advise people troubled with sleeplessness not to take opiates or narcotics, save under the advice of their medical man. Apart from the obvious danger of an over-dose which awaits those who indulge in narcotics, there is also the disadvantage that a very much increased amount of the opiate has to be taken to secure the result which at first followed a moderate dose. The cure becomes worse than the disease, and the subject of excessive narcotism is apt therefore to develop a doubly sleepless condition—the

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one phase due to the original trouble, and the other to the action of the narcotic. If there is any justifiability for a sleepless or nervously irritated man taking anything to produce sleep or to soothe him, his action should be that of dosing himself with the simplest and least harmful of sedatives. Possibly a dose of bromide of potash or bromide of sodium may relieve a simple, uncomplicated case of sleeplessness or worry, but such cases as a rule are not quite so easily treated, and the repetition of the advice to consult a physician in such cases is warranted, if only by the fact that so many persons tamper with narcotics at the present time. When we know that the fashionable modern lady arriving home, during the season, in the small hours of the morning after a round of gaieties beginning with dinner, and ending with "At Homes" and a ball, takes her chloral draught as an ordinary and habitual item in her *régime*, we can understand what modern life of a certain type means in the way of nervous wear and tear and narcotic abuse. The question of sleeplessness I have indicated may be solved in various ways. The latest contrivance for producing a healthy sleep in case

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of insomnia is a couch which I understand is manufactured by Walker's Oscillating Hygienic Bed Company, Glasgow. This bed has been tested in various hospitals, and has received favourable comment from physicians, while one doctor reports that he regards it as a very decided aid in the treatment of insomnia. This bed is fixed at its centre, and by means of automatic mechanism of simple character the head of the couch is alternately elevated and lowered so that a gentle rhythmic movement is imparted to it. The movement is entirely under the control of the person resting in the bed, and in nervous cases appears to exert a decided effect in not merely inducing sleep, but in soothing the patient in a general sense. We can see in the principle of this invention a return to the old principle of the cradle of infancy (only with a decided difference in the movement), which undoubtedly exerted a very marked influence in inducing sleep in the fractious child.

The question of tonic remedies in nerve troubles is one which very naturally crops up, seeing that the general opinion of such ailments regards them as generally due to a lowness of the system. For the cure of this "run-

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down " condition, the average mortal believes that tonics are necessary. He is probably quite correct in this view of matters, although it is perfectly possible to conceive of cases where tonics might do more harm than good. Still the idea of the tonic as a kind of medical " pick-me-up " is one which has received some justification from the common details of medical practice. The list of tonics to which people are accustomed to fly when the need for such aids to health arises, is a very long one—they range from coca to strychnine, and are presented to us in all kinds of guises, from those familiar on the druggist's counter to the products of the wine merchant's store. One rule regarding tonics may be borne in mind, because it involves the great principle according to which tonics should be taken, and because it applies also to drugs of other kinds. This advice is represented by the common-sense remark that all tonics lose their effect when taken constantly, or, what is much the same thing, for long periods of time. With tonics, as with narcotics, the dose which at first serves to brace up the system becomes utterly inadequate to effect that purpose later on ; therefore if the good effect of any tonic

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is to be obtained, that effect should be apparent within a reasonable time, otherwise the tonic should either be altogether relinquished, or another substituted for it.

If I were asked to name any tonic which from its general composition is well adapted as a medicine for ordinary cases of brain-fag and nervous depression at large, I should say "Fellow's Syrup of Hypophosphites" represents such a medicine. It is the best general tonic, probably, which modern medicine possesses, and much benefit (I speak personally here) may be obtained from taking the syrup in a teaspoonful dose well diluted with water thrice daily, after meals. It may be taken before meals by many persons, in which case I think it serves to impart an appetite. This is a little bit of homely advice the advantage of following which I have found personally when stress of work has produced, if not brain-fag itself, at least a condition analogous to it. But I reiterate the opinion that no drug alone will suffice to cure brain worry, the relief of that condition, as already pointed out, being rather a matter of hygiene and placing of the patient under a completely changed set of health conditions.

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I have incidentally referred to the value of rest, and there can be no doubt that in the nerve troubles which affect our modern existence, rest must be deemed one of the chief, if not the principal, conditions for cure. The age we live in may be described as essentially a restless one, and the want of sufficient repose may undoubtedly lie at the root of a vast deal of the irritability which prevails. Rest, however, may be relative. We may have absolute rest, which we endeavour to obtain in sleep, when such of our physical and mental powers as are not completely at rest have at least become slowed down and modified in their action. But the term "rest" is not always synonymous with sleep, and a man may sleep fairly well and at the same time suffer from the effects of want of true repose. The constant and unremitting attention to one or a few details of his business, may produce in any man brain-fag of as distinct a type as that which marks the man who suffers from insomnia. The rest required by such a man (typical of a large class nowadays) is not so much absolute repose as change of occupation. The holiday in a general sense represents such change, but it is possible



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to obtain the good effects of the holiday even throughout the working year. Many men engaged closely in business suffer from brain-fag because they do not take care to ensure that the brain's work is sufficiently varied. In plain language this is what we mean when we speak of a man possessing a "hobby." I should be careful to explain here that I do not mean a "fad." The man with a fad has generally the idea that his mission in life is to reform every person with whom he comes in contact, according to his own narrow and preconceived views. He is a social nuisance, responsible for a good deal of brain worry on the part of his victims. But the man with a hobby injures no one; he takes a delight in his flowers, his fossils, his animals, his aquarium, his coins, his insects, or any other little by-study in which he has found interest and relief by contrast of occupation from the ordinary routine of his daily life. I have frequently said that "the letters to the editor column" of a daily newspaper represents a mental safety-valve for a large number of people, who in their ardent desire to reform some abuse, declare their intention of "writing to the *Times*."

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It is much the same when those persons who, animated by a war-fever, burst forth into songs, odes, and epics in the columns of the daily press. In each case there is a nerve storm generated in the brain cells, and if it finds no vent in some form of physical activity, it expends itself among the brain cells, and produces disastrous effects, varying from a mere explosion of temper or hysteria, to a fit. The use of pen, ink and paper blows off the mental steam, and the individual feels he has done his duty to himself and his fellow-men. It is the same with a man's hobby, it provides him with change of occupation, turns the working of his brain cells into another channel, liberates his nerve energy in fresh directions, and by probably instituting new connections between the groups of brain cells, makes the brain a more efficient instrument for the governance and control of the body. Therefore it is that I strongly advocate the cultivation of a hobby by every person. The late Lord Salisbury, we are told, was in private life a very efficient chemist, and I know men who, in what may be called the leisure time of their lives, have made themselves efficient book-binders, turners, and amateur engineers. Here-

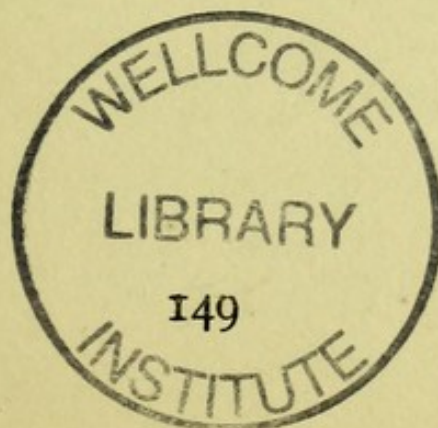
## BRAIN, BODY, AND NERVES

in lies, I think, a tremendous safety-valve for the modern brain cell. It is an efficient instrument enough for the discharge of the work it is intended to do, but it has its own little woes and worries, and must accept the inevitable chances of excessive wear and tear which await other organs of the frame. At the very least we may say, of change of occupation, that the important condition of absolute pleasantness and delight enjoyed by the subject thereof is a very desirable tonic to the physical units which work out our intellectual life. I can conceive nothing more appalling to be contemplated than the spectacle of a man engaged day by day in his business, whose sole literature is represented by his daily paper, and whose life otherwise is divided into a threefold cycle of sleeping, eating, and working. Such a man, I should say, if my observation of life be correct, is more liable far to nervous breakdown than even the hard-worked, over-wrought slave of modern commerce, literature, art, or science.

It is, after all, not work which wears us out, but worry on the one hand and rust on the other. For my part I should assuredly prefer to die in active harness, than to rust ignomini-

## BRAIN, BODY, AND NERVES

ously in some back-water of life. It is when the shadows grow long behind us, and when our brain cells have worked out their little day, that we shall most enjoy prolonged rest—a repose which is all the sweeter, because it succeeds to the heat of life's battle and leads us to the green pastures and quiet waters of existence.



PRINTED BY  
THE EAST OF ENGLAND PRINTING WORKS  
LONDON AND NORWICH

