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Contributors

Byrne, J. Grandson 1870-

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SEASICKNESS
— AND —
HEALTH

DR. JOSEPH BYRNE

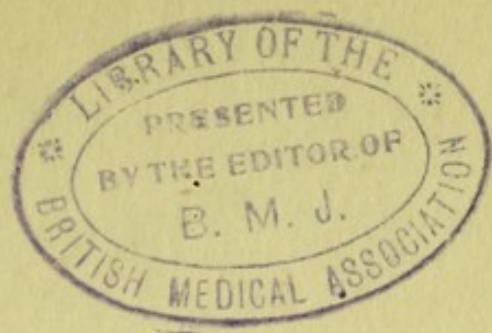
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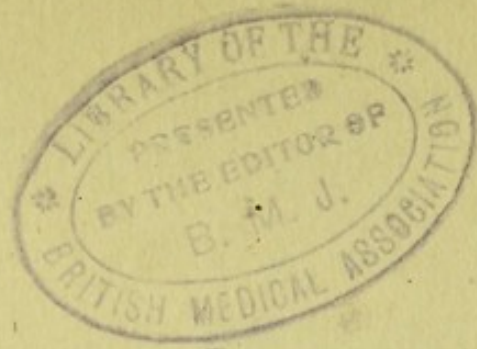
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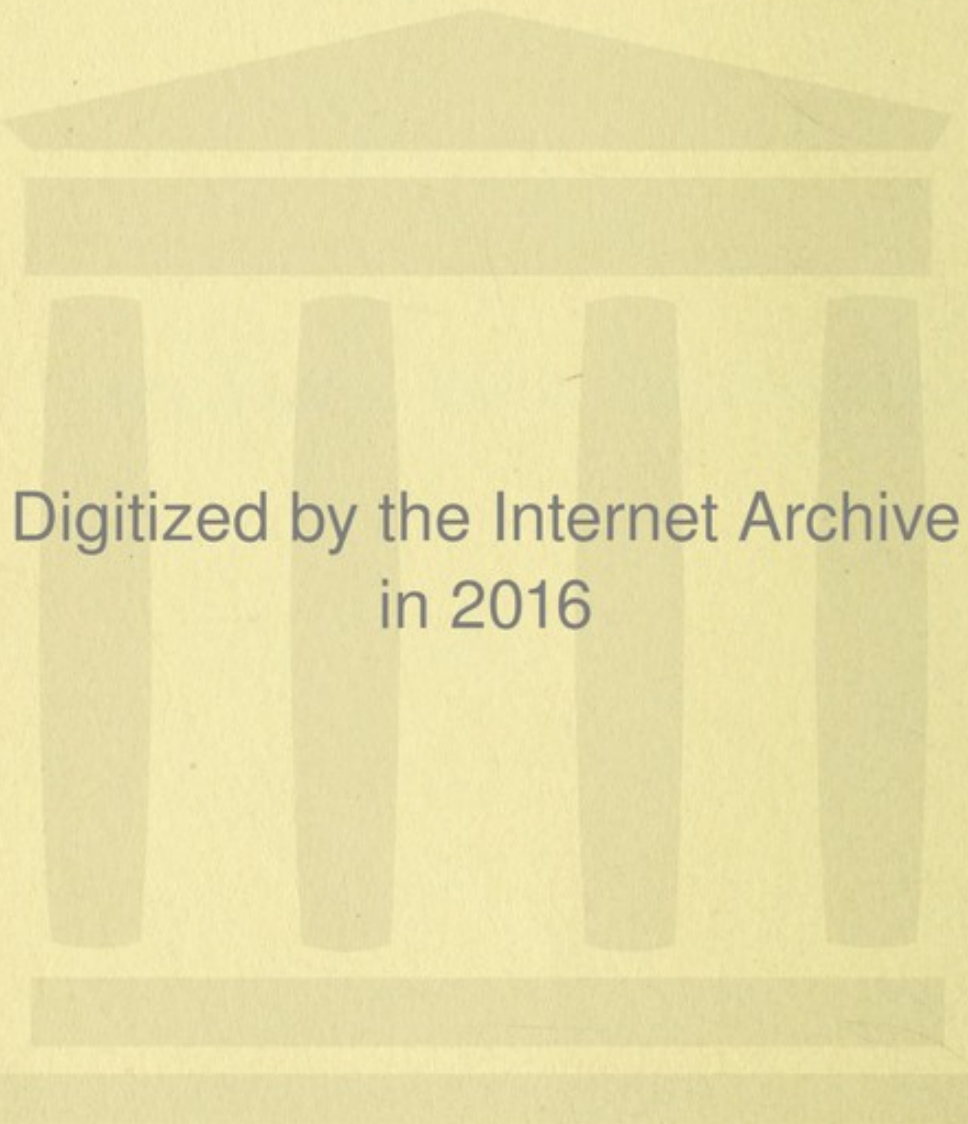
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SEASICKNESS AND HEALTH



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SEASICKNESS AND
HEALTH

A MANUAL FOR TRAVELLERS



BY

JOSEPH BYRNE, A.M., M.D., LL.B.,

AUTHOR OF "PHYSIOLOGY OF THE SEMICIRCULAR CANALS AND THEIR
RELATION TO SEASICKNESS," ETC.



LONDON
H. K. LEWIS
136 GOWER STREET, W. C.
1912

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THE BOOK COMPOSITION COMPANY, NEW YORK

TO

MY FELLOW VICTIMS OF THE SEA, OF ALL
NATIONALITIES AND OF ALL STATIONS
IN LIFE, THIS BOOK IS SINCERELY
DEDICATED

“The King is set from London; and the scene
Is now transported, gentles, to Southampton;

.

And thence to France shall we convey you safe
And bring you back, charming the narrow seas
To give you gentle pass, for if we may
We'll not offend one stomach.”

—KING HENRY V., ACT II.

P R E F A C E

Seasickness is ordinarily looked upon as a trifling ailment. The number of deaths, however, that occur during or soon after a rough sea-trip, as well as the extreme suffering and prostration that accompany the attack are sufficient to raise serious doubts as to the harmlessness of the malady and to arouse in travellers a natural curiosity as to what really may be the effects of seasickness, and whether it is "good for one," as some maintain, or is, on the other hand, a serious affection which may immediately destroy life or leave its mark by way of more or less permanent impairment of one or other of the vital organs. Nothing is more rational than that a convalescent, say, from nervous prostration or heart disease, who is about to take a sea-trip should inquire as to what the possible and probable effects of the journey may be upon his condition as a whole, and more especially upon those organs that were particularly involved in his recent ailment. But where can such a convalescent find assurance that a sea-trip will not injure him or aggravate his condition when nothing is definitely known concerning the actual causation of seasickness, or of its effects upon the various organs of the body in health and disease?

It was considerations like these that induced the author some years ago to make an exhaustive study of seasick-

ness. At that time, even as now, there were various theories as to the causation of this malady. Many medical men of repute were of the opinion that the semicircular canals of the internal ear were in some way implicated, but there was no evidence, experimental or other, to support this assumption, nor was there even a theory as to the manner in which the semicircular canals could cause such symptoms as those of seasickness. When he first began to give the subject consideration, the author was of the opinion that the semicircular canals had nothing to do with seasickness and that the real underlying cause was to be sought in the profound disturbances of the circulation that are such a prominent feature of the disorder. With the object of disproving the semicircular canal theory he proceeded to an experimental study of the semicircular canals. Several methods of stimulating these were tried on the living subject. The most efficacious were found to be: (a) rotation of the subject in a swing or chair; (b) irrigation of the ears with hot or cold water, and, (c) galvanic electricity applied to the head over the site of the canals. It was found, to the author's great surprise, that all the symptoms of seasickness could be reproduced by each of the methods mentioned. This necessitated a modification of his views and he fell back on the theory that the semicircular canals were only indirectly involved, that is, as the result of disturbances of the circulation. Further study, however, compelled him, bit by bit, to attribute less and less importance to circulatory disturbances as the primary cause until finally the semicircular canals remained as the one, indisputable, primary factor

which afforded a rational explanation of the symptoms of seasickness.

Of course there was always evidence of profound disturbances of the circulation in experimental, as well as in ordinary seasickness, but the conclusion was reached that such disturbances were merely associated phenomena and at most of secondary importance as causative factors. It was found also that the conclusions reached regarding circulatory disturbances applied also to disturbances in the digestive, ocular, olfactory and other functions, viz., that all these were, in the main, merely associated phenomena and at best could be regarded as but secondary factors in the causation of seasickness.

Armed with the knowledge and experience derived from his experimental studies, which are set forth in detail in Part II of his more extensive work on the "Physiology of the Semicircular Canals," etc., the author next proceeded to a practical study of seasickness. The results of these studies and the conclusions deduced from them as to the causation, prevention and treatment of seasickness, are set forth in popular form in the present volume. Trips were made on all sorts of craft, ranging from a small row-boat to a transatlantic liner, including motor launches, fishing smacks, etc. The trips were made in different waters and especially on the English Channel, which has such a dreadful reputation for causing seasickness. Most of the trips were of necessity made on public boats, so that the observations of the effects upon the circulation, etc., had to be made in the presence of a somewhat mystified multitude. Various opinions were formed as to the object

of our work. Some volunteered the opinion that it was some get-rich-quick scheme. Others thought the boat was unsafe and that we were testing it. Still others, believing that we were anarchists and up to mischief, insisted that the skipper or commander should have a talk with us. As a rule nobody interfered directly with us. Occasionally, however, "cranks" abused us openly and derided our efforts without having the faintest notion of what we were doing. On one or two occasions it looked as though we might have to resort to force to resist what was a manifest gross invasion of our rights. Fortunately, thanks to peace-loving mediators, reason and right prevailed, but it is not at all certain that things would have passed off so quietly had it not been for the general air of physical efficiency presented by the individual members of our party. On the whole, however, it must be said that people in general treated us with much consideration. This was especially true of people encountered in British and Continental waters.

Present day enlightenment is such that the author has not hesitated to use physiological and anatomical terms occasionally throughout the text. The reader will find that all such terms as might be unfamiliar to the reading public are fully explained in the glossary.

In the course of these studies of the semicircular canals and seasickness numerous methods and drugs were tested for the purpose of determining the best means of preventing and treating attacks of seasickness. It was found that certain drugs, when properly administered, were entirely effective in preventing the disorder in the most sus-

ceptible subjects, even upon the dreaded English Channel, when the weather was rough and the small steamer mercilessly tossed about by the waves. In addition to the general outlines of treatment laid down in Chapter V, there are given in Chapter VI practical hints for the prevention of seasickness and for the treatment of an actual attack. Careful instructions are given as to general management and dietetics, with definite information concerning the most effective preventive and remedial measures, special attention being given to such drugs as may be safely entrusted to prospective passengers for self-treatment. A separate chapter is devoted to digestion and diet. It is to be hoped that the hints given on these subjects may prove useful to those suffering from digestive and nervous disorders, whether these latter originate on sea or land.

No experimentation on animals was found necessary in the course of these studies, the author having found that the semicircular canals had been most exhaustively studied in this way in the various laboratories both in this country and abroad. Those, however, who have suffered from seasickness will readily appreciate what the subjects who volunteered their services in the interests of humanity endured. The author wishes especially to thank his friend, Mr. Hugh J. Smith, for the patience and fortitude with which he, at all times, submitted to the various tests which, in many instances, had to be repeated over and over again to ascertain the true state of the facts. The author himself has travelled extensively on sea and has always been a sufferer from seasickness. Hence the time and labour devoted to these studies, which were conducted

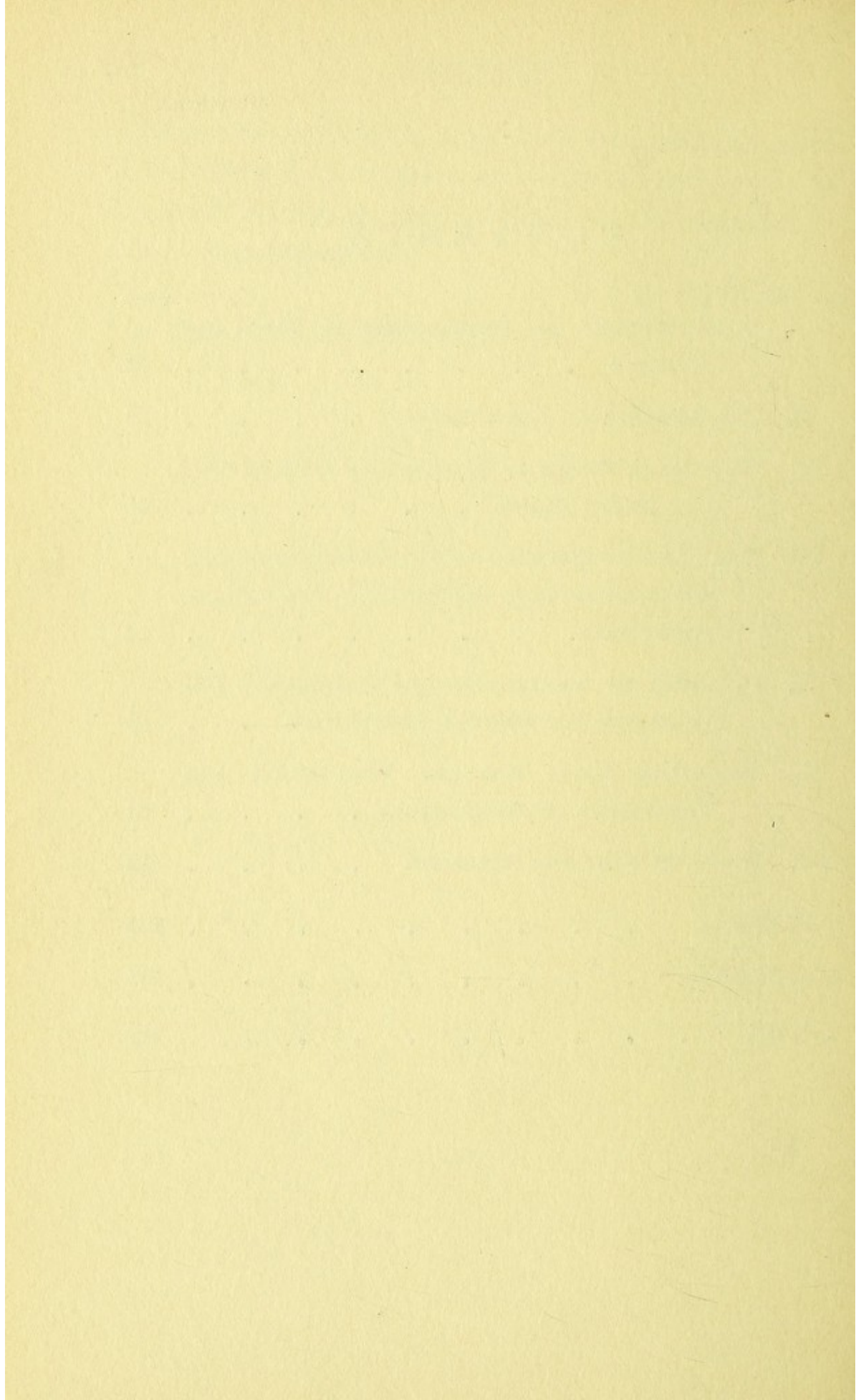
at his private expense, he considers advantageously applied if his efforts help toward a better understanding of the nature of the malady and alleviation of the unspeakable misery that attends it.

J. BYRNE.

29 WEST 61ST STREET, NEW YORK CITY.

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SEASICKNESS AND HEALTH

CHAPTER I

SUSCEPTIBILITY TO SEASICKNESS IN MAN AND ANIMALS

It is difficult to arrive at any accurate conclusion as to the percentage of travellers affected by seasickness, partly because there are different grades of severity of the malady and partly because it is a difficult matter for most people to tell the truth about seasickness or about anything else that they imagine tends to detract from their perfections. On one occasion as I crossed the ocean in the crowded season my room-mate happened to be a young American returning from his first trip abroad. At our first meeting he boasted much about his immunity from seasickness. On the first day out the weather was rough and my young friend did not appear to be quite so confident in himself. Indeed his appearance gave every indication of oncoming seasickness. He however insisted that he felt all right and ridiculed the idea that he was getting seasick. As the weather continued to get rougher I was compelled to leave him on deck and take to my bed. Scarcely had I settled myself comfortably when a dark object shot through the door of the cabin and landed in the bunk directly under mine. Leaning gently over the edge of my berth I discovered that the dark object was no other than my room-mate who had rather suddenly made up his mind that it "was *too cold* to stay on deck." I felt very sorry for the

poor fellow on account of his youth and modesty, and accordingly I made solicitous inquiries about his health and more especially as to the condition of his appetite and digestion. His ingenuous reply was "Oh, *I'm* not sick. It's only my stomach that's a little upset. I never get seasick, you know."

The boy was young, and in youth there is a monstrous tendency to see things as we want to see them, regardless of the vulgar obtrusiveness of facts. Indeed, after my own first voyage, on which I was dreadfully seasick, I "forgot" all about my frightful experience and rather openly boasted of my immunity. Looking backward the only reason I can assign for such barefaced mendacity (I was fairly truthful in other matters) is the fact that at that period I had budding aspirations of becoming an athlete, and such an infirmity as seasickness seemed altogether incompatible with athletic prowess.

The habit of lying about susceptibility to seasickness is, however, not confined to children and vain youths. Professional athletes, tumblers, acrobats, equilibrists, hand balancers and people in general who earn their living by performing feats of strength and agility are very prone to conceal what they consider a physical weakness. I have known an amateur distance-runner, the holder of many records, to deny that he was ever seasick after I had seen him actually in the throes upon an ocean liner. As a matter of fact many of the very best athletes of the present day, both amateur and professional, are quite susceptible to the effects of seasickness in one form or another.

All this lying is quite unnecessary; for susceptibility to seasickness implies no physical or mental defect but rather the contrary. Many of the greatest men in all lines of endeavour have been victims of seasickness. To mention a few, Cato the Elder, Cicero, Lord Bacon, Goethe, von Helmholtz were all victims. Brain-workers are said

to be more susceptible than others, but Mr. Thomas A. Edison, that colossus of the world of invention, informs me that he has never been susceptible. It is of interest to note that Mr. Edison regards favourably the author's conclusions as to the causation of seasickness.

Professional dancers and singers are very susceptible although Mr. Caruso, the celebrated tenor, states that he has always been immune. Indeed, so common is it for the perfectly strong and healthy to become stricken that the burden of proof rests with those who are immune to show that they are free from defect—especially defects in the internal ear.

Susceptibility to seasickness merely implies that the individual is the possessor of ready, alert, balancing mechanisms which are capable of being rudely disordered by the motions of the boat, whereas immunity often means degeneration, from old age, heredity, disease or other cause, of the sensory end-organs of the vestibular nerve within the internal ear. The stricken sufferer need not therefore envy too much that type of individual, usually undersized and puny, who, chanticler-like, struts the deck puffing his vile-smelling cigarette; nor that other type of person whose general look of well-being inspires the sick with thoughts of hate as in loud voice he proclaims that he "never misses a meal."

It is a fact that persons of rugged and frail constitutions are alike subject to seasickness. Some observers have stated that neurotic individuals are more susceptible than those of coarser fibre, but there are many exceptions to this rule. The most delicate neurotic women are sometimes immune, whereas robust, rugged individuals are frequently most susceptible.

Professor Mike Murphy, the world-famed trainer, is of the opinion that athletes are less liable to seasickness than others, although he admits that he is by no means sure of

this. He is of the opinion that indiscretions in diet, especially at the commencement of the voyage, have much to do in causing seasickness. He confesses, however, that seasickness is a puzzle to him and he has no theory to account for it. His interesting letter in answer to mine inquiring how the members of the famous American Olympic Team of 1908 stood the journey across the sea is as follows:

ATHLETIC ASSOCIATION
OF THE
UNIVERSITY OF PENNSYLVANIA
Franklin Field, Philadelphia.

JANUARY 30, 1909.

“JOS. BYRNE, M.D.

“*Dear Sir:*—I should have answered your letter of December 25th sooner, but I laid it away amongst a lot of others and so forgot all about it. In answer to your first question will say that I never had a sprinter seasick on the trip over, but one of the best distance men I ever had was sick the entire trip, both going and coming. His was the worst case I ever had. One of the weight men, ———, was sick for a couple of days on the last trip; it was more owing to his overeating the first couple of days than anything else; he went at everything on the table and overloaded his stomach. One of the swimmers was sick, too. None of the weight men, nor any of them (the athletes) in fact, lost many meals. We had good weather *going* in about all the trips I have made and very few were sick. I think it safe to say that athletes are less apt to be sick than ordinary people. Am not sure of this. One time when I went to Cuba I had one of the best football tackles with me; he was never sick in his life, and in the fiercest battle his stomach was always the best. Well, when we got off the Hatteras there was a little race on the sea and he was sick the rest of the trip; also coming back. There was no cause for it. We had a state-room on the upper deck and in front, and slept with the door open. I was ashamed of him. None of the vaulters, jumpers or men on the Olympic Team were sick except those two I men-

tioned. A few of the others might have had a little trouble but if they did they didn't let me know of it.

"As you know, I live by studying nature. From long habit I watch it very closely, but I must admit this seasickness has me muddled. I can't account for it and have no theory. Hoping you will do better, I am,

"Yours truly,

"M. C. MURPHY."

Notwithstanding the celebrated trainer's experience it is a fact, nevertheless, that all kinds of athletes, including sprinters, distance-runners, walkers, jumpers, vaulters, weight-throwers, pugilists, wrestlers, swimmers, etc., are susceptible to seasickness.

A few years ago a man named Joe Grimm gained quite a reputation among followers of pugilism because of his ability to take severe punishment without being "knocked out." He was a comparatively small man and rather mediocre as regards skill and hitting power. In spite of all this, however, he was pitted against the biggest, hardest hitting and most skilful opponents that could be procured. In every instance he was beaten and pummelled most unmercifully but he invariably escaped without being "knocked out." Blows about the jaw and head jar the delicate sensory organs situated within the internal ear and in this way cause the familiar weakness, unsteadiness of gait, disturbance of vision, grogginess, etc., which pave the way for the final blow that renders the contestant unconscious or too weak to stand upon his feet. Knowing these things the author thought it would be interesting to find out whether this individual who could withstand so much beating about the head was susceptible to seasickness. In a rather amusing letter the pugilist replied that he was subject to seasickness although he was partly inclined to attribute much of his suffering to over-indulgence in alcohol. He stated, apparently after a close

study of the subject, that he had come to the conclusion that seasickness could, in every instance, be traced to an overfondness for the "wet goods" as he terms alcoholic drinks. Grimm, however, admits that on one occasion when he crossed the ocean as a stoker he was made frightfully seasick. It seems, therefore, that almost any one can be made seasick if the conditions are bad enough and the individual has not degeneration of the nerves of the internal ear.

Battling Nelson, the former light-weight champion of the world, is another pugilist who was for years invulnerable to the knockout blow. Nelson informs me that he has never been troubled with seasickness. On the other hand, however, many of the greatest and most durable of the pugilistic champions have been very susceptible.

Young children, the very old, and those in a very weakened condition from chronic disease, anemia or other cause are comparatively immune from seasickness. The reason for these exceptions is that in very young children the balancing mechanisms are not yet developed and educated whilst in the old and chronically ill, these mechanisms have already undergone degeneration and decay. It is a fact, however, that many young children are susceptible to seasickness and more especially the children of susceptible parents.

It is well known that chronic diseases such as phthisis, cancer, etc., lead to degeneration of the sensory nerve endings within the ear. And similarly in advancing years the gradual deterioration of the nervous mechanisms, and especially of the nerves within the internal ear, renders the individual slower and less accurate in the execution of his movements. This in part explains why a boxer or runner at forty is, generally speaking, no longer a match for his opponent at twenty-five.

There is no doubt that alcohol taken in large quanti-

ties so deadens the nervous mechanisms that the individual becomes less susceptible to the effects of the ship's motions. The effects of alcohol are, however, so mischievous in themselves that no sane person would think of recommending it for this purpose. I have known a very susceptible individual to drink so much gin just before sailing that he was carried aboard in a state bordering on coma. Of course he was not seasick for the simple reason that his nerves were as insensitive as if he were under the influence of a general anæsthetic such as ether or chloroform. As he began to recover from the effects of his alcoholic poisoning his nerve-centres gradually became accustomed to the range and rhythm of the boat's movements so that he actually escaped being seasick. It is fair to state, however, that he remained in bed for some days and did not dare taste food on account of the extreme degree of irritability of his stomach which was acutely inflamed as the result of his overdose of gin.

It is quite a common thing for individuals with marked susceptibility to seasickness to acquire immunity. Sometimes immunity is acquired rather early in life. For instance in families afflicted with an hereditary tendency to premature deafness the individual members may begin to lose their hearing at an unusually early age, e.g., at twelve or fifteen. With the loss of hearing immunity to seasickness is very likely to develop. The loss of hearing and immunity to seasickness in such cases are the result of degeneration of the nerves arising within the internal ear, viz., the vestibular and cochlear nerves. What happens early in life in families afflicted with premature hereditary deafness, viz., degeneration of the nerves springing from the internal ear, happens also to a greater or less extent in every individual with advancing age, causing lessened acuity of hearing, a marked deterioration in the execution of active balancing movements, and dimin-

ished susceptibility to seasickness. Certain diseases of the internal ear and poisoning by certain drugs, e.g., quinin, may cause sudden deafness with more or less immunity to seasickness.

On the other hand occasional instances are met with in which persons hitherto immune have developed a susceptibility for seasickness. The author knows two elderly sisters, one of whom was very susceptible to seasickness in her youth, whilst the other never knew what seasickness was until about the age of forty. The facts in these interesting cases were as follows. The sisters were of a family in which there was an hereditary tendency to premature deafness and the one who escaped seasickness in her youth began to be deaf at twelve years of age, that is before she had begun to travel on sea. Hence her immunity. About the age of forty, however, she developed a mild degree of inflammation in one ear. This heightened the irritability of the few remaining nerve-filaments distributed within that ear as compared with the irritability of the corresponding nerve-filaments distributed within the opposite ear. This inequality of irritability heightened the effect of the boat's motions in disturbing the equilibrium, so that seasickness resulted. Moreover, the only position in which this person could get relief was when she lay upon the side of the unaffected ear. The sister who had been susceptible to seasickness in her youth developed immunity at about thirty-five years of age as her hearing gradually deteriorated.

Various opinions are expressed in the literature as to whether birds and animals are subject to seasickness. One author boldly states that birds and acrobats are immune. Another maintains that dogs, sheep, cows and chickens are susceptible, whilst hogs, ducks, and geese are immune. The late Dr. Fordyce Barker recorded the fact that his horse, after boarding a ferry-boat, fell down

in a fit and became covered with foam. Dr. Barker believed that the horse's behaviour on that occasion was entirely due to seasickness.

The author has interviewed several persons whose business it is to take care of horses and cattle on ocean steamers. The information obtained shows that these animals are subject to seasickness and have to be fed most carefully upon voyages. Of course it must be understood that a person or an animal may be seasick without necessarily vomiting, since stomach disturbance is only one of the many disagreeable symptoms of the malady. Many persons go to sea and by careful regulation of their diet manage to escape the severe manifestations of seasickness. Others, however, are so susceptible that merely crossing the river on a ferry-boat may cause vomiting.

Dr. G. G. Flemyng, surgeon on the White Star Liner *Teutonic*, is authority for the statement that animals are affected by seasickness just like human beings. Dr. Flemyng was surgeon in charge of the vessel which, a few years ago, brought over the Australian collection of animals, amounting to five thousand specimens, to the London Zoölogical Gardens. The doctor stated that most of the animals came down with common ordinary seasickness, and that many of them died from the malady.

CHAPTER II

THE EFFECTS OF SEASICKNESS

The insidiousness with which seasickness overtakes its unsuspecting victims frequently furnishes incidents that prove amusing even to the victims themselves. Some years ago a young Oxford instructor and myself squatted ourselves on the hurricane deck of an Anchor Line steamer just after we had sailed from Moville on our way to New York. A fairly brisk head wind was blowing, but from this we were comfortably protected by a stretch of canvas. We enjoyed our cozy corner very much and the time flew by rapidly as we chatted about various subjects in which we had a common interest. In the course of our conversation I noticed that my friend changed color somewhat and I asked him if he were getting seasick. "What!" said he, "me get seasick? Not at all. I'm feeling quite fit." We continued chatting for some time longer, but gradually my friend's share of the conversation dwindled down to faint monosyllables as he grew greener and greener about the ears until finally he unceremoniously bolted for his cabin. Left to myself I continued to enjoy the soothing song of wind and wave; but presently my eyes rested on a boy of about fourteen lying near me, stretched upon the deck, apparently too sick to care what might become of him. Seeing that he had no rug or overcoat, and fearing that he might suffer from exposure, I volunteered to go to his cabin and bring something to wrap about him. He thanked me gratefully as I started on my kindly mission. It turned out that his cabin was located near mine,

but by the time I reached the door of my own cabin I was so sick that I short-circuited into my berth where I lay helpless, as much unconcerned about the welfare of the boy I had left on deck as he was himself. No harm came to the boy as the result of his exposure, but his fortunate escape was in no way to be attributed to me. Seasickness had nipped my efforts in his behalf while they were as yet mere budding intentions.

Frequently the traveller goes to bed on the first night out at sea feeling quite well only to wake up in the morning sick and wretched, ready to vomit the moment he attempts to leave his berth. The movements of the boat are capable of so upsetting the mechanisms of the circulation and digestion during sleep that when the erect posture is assumed vomiting immediately ensues.

It is hardly possible for any one who has not been through the experience himself to form an estimate of the anguish and suffering endured by the victims of seasickness. The sickness itself and the suffering incidental to it are too frequently taken as a matter of course and treated lightly or with positive indifference. The mental depression that accompanies seasickness in its earlier and lighter phases is often so great that it unhinges reason itself. Ungoverned thoughts, distorted and oppressive, run riot in the disordered brain, and fears of all sorts torture the unfortunate victim until he is brought to the verge of insanity. Such extreme effects are not so frequently encountered perhaps in cabin passengers, since these have the benefit of cheerful surroundings and are comforted and looked after by their fellow-passengers as well as by the ship's attendants. But who can realize the agonies endured by emigrants in the steerage, and especially by those of tender years who have, for the first time, torn themselves loose from the sacred ties of home and country with all that these imply for the heartbroken young exile?

It is by no means an infrequent occurrence for individuals suffering mental torture, as the result of seasickness and neglect, to become insane under the burden of their misery and to seek relief in self-destruction.

It is a rather common practice for physicians to send their convalescent patients on an ocean-voyage to complete their recovery. The effects of seasickness upon the nervous system as well as upon the heart, blood-vessels and digestive organs, as shown by the author's studies, should make the physician hesitate before recommending a sea-voyage to a convalescent, or to one suffering from a serious organic or nervous disorder. No one would think of allowing an untrained man, even though otherwise healthy, to enter a contest which might subject him to severe, prolonged strain, or entail a heavy draft on the body's store of reserve energy. And yet a severe attack of seasickness subjects the heart and blood-vessels to a greater strain perhaps than a boxing or wrestling bout. If any one doubts the truth of this statement he is respectfully requested to study the author's figures and charts showing the behaviour of the heart and of the circulation as a whole in actual cases of seasickness. See "Physiology of the Semicircular Canals and their Relation to Seasickness."

One of the most important of the immediate effects of seasickness is a general lowering of the vitality which, of necessity, is accompanied by depreciation of the natural resistance of the individual to infectious diseases. It might be supposed that this lowered resistance is partly compensated for by other conditions obtaining at sea, since fewer disease germs are encountered at sea than on land. This latter statement is, however, not true where there is overcrowding of passengers in small state-rooms and poor facilities for ventilation. Where two or three passengers occupy the same cabin, if one of them happens to be the

victim of a communicable disease such as tuberculosis, there is great risk of the others contracting the disease. To travel under such circumstances is to openly court disease by constant exposure to its germs when the natural resistance to infection has been impaired by seasickness, deprivation of food, crowding in poorly ventilated rooms, lack of exercise and by mental and physical depression. And the worst feature of some of these chronic infectious diseases is that their germs may be taken into the body and harboured there for varying periods before any symptoms manifest themselves. I know that ship companies in general are unwilling to accept as passengers, individuals afflicted with communicable diseases such as tuberculosis; but I also happen to know of numerous instances in which persons in the advanced stages of tuberculosis managed, somehow or other, to get across the ocean. I also know of an instance in which a healthy first cabin passenger was put into a small state-room with two victims of tuberculosis, one of whom coughed incessantly night and day, and had not the slightest notion of how to take care of his sputum so as to minimize the risk to others. Moreover, this man had brought to him from the ship's library, book after book to be thumbed and coughed upon from cover to cover. Further remarks on this point are unnecessary.

Another of the serious effects of seasickness is heart failure. This is not likely to occur in young individuals with perfectly sound organs, but in the weak and debilitated, and especially in stout persons over forty years of age who have been good livers, and who have neglected to keep their bodies in tune by a sufficient amount of muscular exercise, heart failure or heart impairment of a more or less permanent nature is always a possibility. I have seen middle aged women turn grey in the face, as though they were about to expire, after climbing the companion-

way to get out on deck. The effect of such a strain upon the heart and upon the future history of the individual is not readily appreciated by any but the physician accustomed to follow his cases in order to trace the causes of ultimate break-down in patients suffering from heart affections. The runner who collapses in a race from heart failure, or the young oarsman who topples over during a 'Varsity race may seem to recover quickly and to be in as good a state of health as he was before his collapse. The subsequent history of such cases shows, however, that the heart never fully recovers from such strains but tends to break down early in the declining period of life, especially if the individual attempts any active exercise such as playing singles at tennis with youthful opponents. In this way early indiscretions tend to shorten life at the other end or to impair the individual's efficiency at a period when he should be in the very zenith of his power and usefulness. Here it is pertinent to remark that the methods of physical training at present employed in American schools and colleges are open to criticism. The real aim of athletics should be, not success in competition, but healthful diversion and recreation with a view to increasing the efficiency of the individual as a whole. Preparation for school and college contests is made too much a matter of hard work entailing a serious strain upon the nervous system.

As in study, so in athletics, love of the work for its own sake should be inculcated, so that boys may be brought up in healthful habits of exercise and self-denial, which will stick to them long after they have left college. What benefit is it to a young man to be able to break the half-mile record at twenty if, at thirty-five, he is to become a shapeless mass of flesh with scarcely enough "wind" to carry him upstairs?

Unquestionably it is a good thing to subject the

muscles and organs occasionally to a moderate amount of strain, as this helps to maintain that margin of reserve which every organ of the body possesses, and which at any time we may be compelled to fall back upon in the daily routine of events. But this is a very different thing from training for championship contests for which only the physically elect are eligible. Cross-country running may be an excellent form of exercise, but boys who have just come in from a four-mile run are not in any condition to tackle problems in algebra, nor indeed any other form of mental work, without being allowed proper time for rest and recuperation. Yet this very thing is, to my own knowledge, done in one of the leading preparatory schools of America.

Prolonged class gymnasium work is, like slow, careless walking, a nuisance, and only causes fatigue without doing any particular good. Artificial forced breathing is dangerous and is based on a gross misconception of the physiology of the respiration and circulation. Forced respiration, when practised for a short time, can bring an individual to the verge of collapse. Normal breathing is carried on without the aid of the will, and the proper way to get the respiratory organs to do extra work is to exercise the body and let the circulation and breathing take care of themselves. I have known a young man to fall down and die on the floor of a gymnasium as the result of obeying an instructor's order to breathe artificially at a moment when the individual's heart was labouring as the result of class exercises.

After heavy exercise the advice is given in many gymnasia "to plunge into the swimming-pool and to thrash about with arms and legs as actively as possible." This is poor advice, for the object of bathing after exercise is to restore and refresh the individual by aiding in the removal of fatigue poisons and by rousing the lethargic

reflexes as well as by direct stimulation of the skin-muscles and blood-vessels. It is by its effect on these latter that the cold plunge or shower produces that afterglow in the skin (tonic hyperæmia) which prevents the tired athlete from taking cold. The only effect of thrashing about actively in the pool after violent exercise is to add to the accumulation of fatigue poisons and to exhaust the sources of reserve energy which the bath might draw upon for the protection of the individual. In this way active swimming after severe exercise exposes the athlete to great risk of catching cold or of otherwise becoming ill. If one wants to swim this is exercise enough in itself, especially if one uses the speed stroke. And similarly if one wants to run or row or play handball the swimming should be left out as the cold shower or plunge is quite sufficient after any form of active exercise.

The boy who learns to play a good all around game, such as regulation handball (I do not mean the handball that is played with a soft ball in small, closed, dusty courts, but handball with the hard ball in open or properly ventilated courts sixty feet long), will derive more benefit from his college physical training than the winners of intercollegiate championships; for handball is a game that can be played to advantage by the city man well into the declining period of life. It can be played, moreover, with one or two opponents at all times and in all seasons; and it gives the athlete all the exercise he wants without entailing any of the risks, such as black-eye, bruised feelings, etc., which one runs in boxing, which is the only other game that can compare with handball as an available efficient means of exercise for the busy city man.

It is a hopeful sign of the times that people in general are taking to active exercise, and it would be too bad if our salaried physical instructors should miss the opportunity of doing the general public a lasting service merely for the

sake of developing one or two record-breakers who may never be heard from after leaving school. In a properly regulated system of physical instruction there should be no driving. The normal boy needs restraint rather than driving; and where driving is necessary it is a sign that there is something wrong with the individual or with the system of training. And here it is well to note that parents are by no means in such sympathy with college athletics that they are willing to risk the lives of their children for the sake of "putting a winner over." The average boy needs more attention and encouragement than he receives. He may be a hopeless case from the trainer's point of view, but it is well to remember that he may have in him the elements of something incalculably greater than mere brawn.

Previous allusion has been made to the depression that accompanies seasickness, especially in its milder phases. The mental suffering frequently so unbalances the mind that the unfortunate victim may be driven to suicide, as happened quite recently in the case of a well-known New York physician. This is one of the gravest and least appreciated of the dangers of seasickness. There are many ways in which seasickness may affect individuals. In some it will promptly sicken the stomach, but in others, from one cause or another, the stomach may not be markedly affected whilst the mental distress may be extreme. In these latter cases the individuals, especially if they happen to be travelling alone, and have not made acquaintances, are likely to become morbid and utterly incapable of controlling their thoughts. Not realizing that their trouble and distress are of physical origin and the result of seasickness, their mental perspective becomes markedly distorted. A certain philosopher has said that intellect is invisible to him who has none. It may be said with equal fitness that the sufferings of these victims of

seasickness are absolutely unintelligible to those who have not themselves endured them. But when it is realized how such trivialities as a cloudy day, the noise of splashing water, or the odour of tobacco-smoke may affect the irritated nerves in seasickness it is scarcely a matter for wonder if *neglected* individuals are occasionally driven to suicide by their torments. It is probable that it was an instinctive feeling of the need of cheerful companionship that led, in the first instance, to that relaxation of social rules which is one of the curious characteristics of travel on sea.

Vomiting of blood may occur as the result of straining and retching in seasickness. Some deaths from this cause have been reported in the literature.

Seasickness may have serious effects upon the prospective mother. Many cases of miscarriage as well as of premature and precipitate labour have been recorded. Undoubtedly marked irritation of the semicircular canals can cause such accidents. The author knows a young woman who was brought to the verge of miscarriage by riding in a motor 'bus. The strange feature of the case was that this individual had been insusceptible to seasickness and carsickness from childhood, as a result of a serious attack of acute ear disease which left her with badly impaired hearing. A day or so previous to going down town on a shopping tour she began to have pain in one ear. With this she had a little fever and her hearing became more acute in the painful ear. When the time came for her to go down town the motions of the 'bus made her so dizzy and sick at the stomach, and caused such cramps in the lower abdomen, that she was compelled to return to her home and call her physician.

During or after an attack of seasickness the hair may become dry and sickly and fall out freely. This is merely one of the secondary effects of seasickness brought about

through disturbances in the nervous system. In a similar manner seasickness often takes the "edge" off athletes who are already trained for a contest. Many famous athletes have told me that after a rough sea-voyage it has taken several weeks and even months before they came up to their previous performances.

Following a rough sea-voyage it is frequently found that the menses may be suppressed in young women for periods extending from a few months to two or three years. This again is to be attributed mainly to disturbances in the nervous system and to congestion of the internal organs, more especially of the ovaries, both conditions being in turn the result of seasickness.

Where the attacks of seasickness are frequently repeated, as in constant successive travelling on different kinds of small boats during an extended tour, the continued congestion of the abdominal viscera may bring about a condition of gastritis or inflammation of the lining membrane of the stomach of the chronic or subacute variety, which may remain with the patient long after his tour has come to an end. This is more apt to occur in severe protracted cases of seasickness and in severe cases which have been mismanaged or poorly treated.

The question has been frequently discussed as to whether a person can catch a common, ordinary "cold" at sea. It used to be the general belief that it was quite unusual for individuals to catch cold at sea although Dr. Fordyce Barker held the contrary opinion. Our present view regarding the nature of a cold is that it is an infectious inflammation of the respiratory tract and that the chief determining factors are lowered resistance from fatigue, exposure or other cause, and infection. The author has found "colds" to be rather common at sea when the passengers were crowded together in small cabins, especially when the weather conditions were such that the portholes

had to be kept closed; whereas when the weather was fine and the cabins not too crowded, "colds" at sea were quite exceptional.

The constipation which is sure to occur in almost every passenger who goes to sea is one of the immediate effects of seasickness and is the result of irritation of the nerves in the internal ear acting through the nerves distributed to the stomach and intestines. Of course abstinence from food is also a factor in causing constipation at sea, but the real underlying cause is the disturbance of nervous function created by the motions of the boat.

The effect of seasickness in shortening life at the other end by impairment of some vital organ through excessive strain has been already mentioned. Seasickness may also have a most serious influence when it occurs as a complication of other diseases at sea. In these instances the seasickness may be, and often is, the deciding factor of life or death.

The "sea-legs" which render a person's gait awkward for some time after a voyage are the result of impressions stored within the cells of the brain and spinal cord as the result of learning to walk and balance upon the moving ship. As this latter education of the nerves and muscles is more or less in conflict with the experience of these structures in ordinary locomotion the latter is perfectly executed only when the memory of the recently acquired movements has been obliterated or is ignored.

Newly wedded couples make a sad mistake when they go to sea to spend their honeymoon. Honeymooning is at best a custom of very doubtful benefit to young people just entering upon independent domestic life; but honeymooning on a long voyage over rough seas, with the nerves of both parties strained to the breaking point, gives such opportunity for intimate soul-scrutiny that long before the end of the voyage one or other of the parties, and per-

haps both of them, may be seriously contemplating the means of escape from matrimonial fetters that all too soon have grown irksome. It is quite a common thing for married couples to quarrel at sea. Even ordinary friends may conceive a marked temporary dislike for each other if they are thrown together too much on the voyage. The only people who seem not to tire of each other's company on shipboard are newly acquainted young lovers who seem to remain indefinitely in a state of comparative ignorance of each other's shortcomings and imperfections. But lovers are the exception to many rules, and in all lands they have ever been the envied and privileged of gods and men.

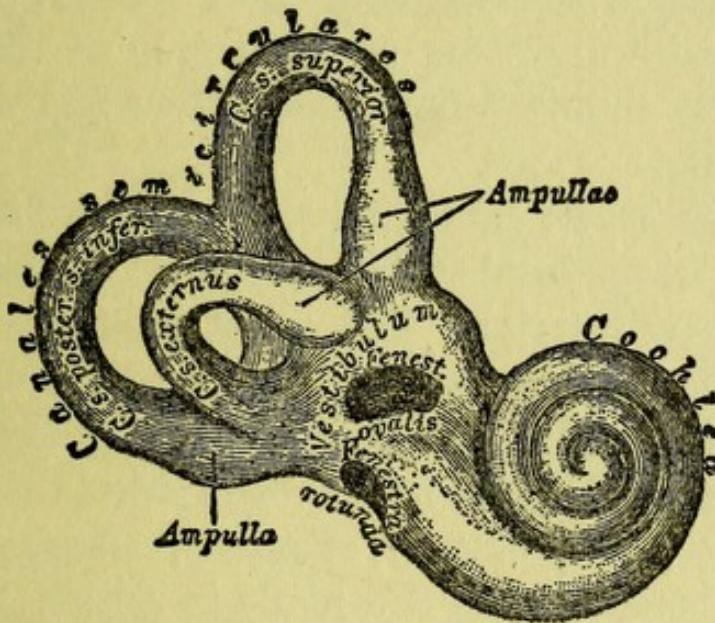
CHAPTER III

HOW SEASICKNESS IS CAUSED AND HOW RECOVERY TAKES PLACE

From time immemorial seasickness has been attributed to all sorts of causes. This of itself is evidence that the true cause of the malady has not been hitherto discovered. Disturbances of digestion, nausea, and vomiting have always been salient features of seasickness, but since the digestive functions have been shown to be, to a great extent, under control of the brain and upper portion of the spinal cord it is evident that the cause of seasickness, in the first instance, must be sought in some perturbation of the nervous system and not merely in the taking of food that disagrees with the stomach.

In the last analysis seasickness must, in some way or other, be the result of the motions of the boat—that is of the pitching, rolling, etc. Practically all authors agree on this point. There is much difference of opinion, however, as to the precise manner in which these movements cause seasickness. Some maintain that gross concussion or jarring of the abdominal organs is the immediate cause whilst others insist that concussion of the nervous system as a whole plays the leading *rôle*. Without going into tedious details it may be stated at once that the author's experiments have shown very conclusively that seasickness is caused by repeated, irregular stimulation of the vestibular nerve. This nerve is a nerve of special function, just as the optic nerve is the nerve of seeing, and the auditory nerve the nerve of hearing. The special function of the

vestibular nerve is the automatic (non-voluntary) control of movements involved in maintaining the equilibrium of the body. The fibres of the vestibular nerve originate in the labyrinth or internal ear, where they are in direct continuity with highly specialized sensory end-organs which are grouped together at five distinct points, viz., three in the semicircular canals and two in the vestibule. The labyrinth or internal ear, located within the temporal bone, is divided into three portions, viz.: (1) an inner portion, the *cochlea*; (2) a middle portion, the *vestibule*, and (3)



The Bony Labyrinth $\times 3$. (Heitzmann.)

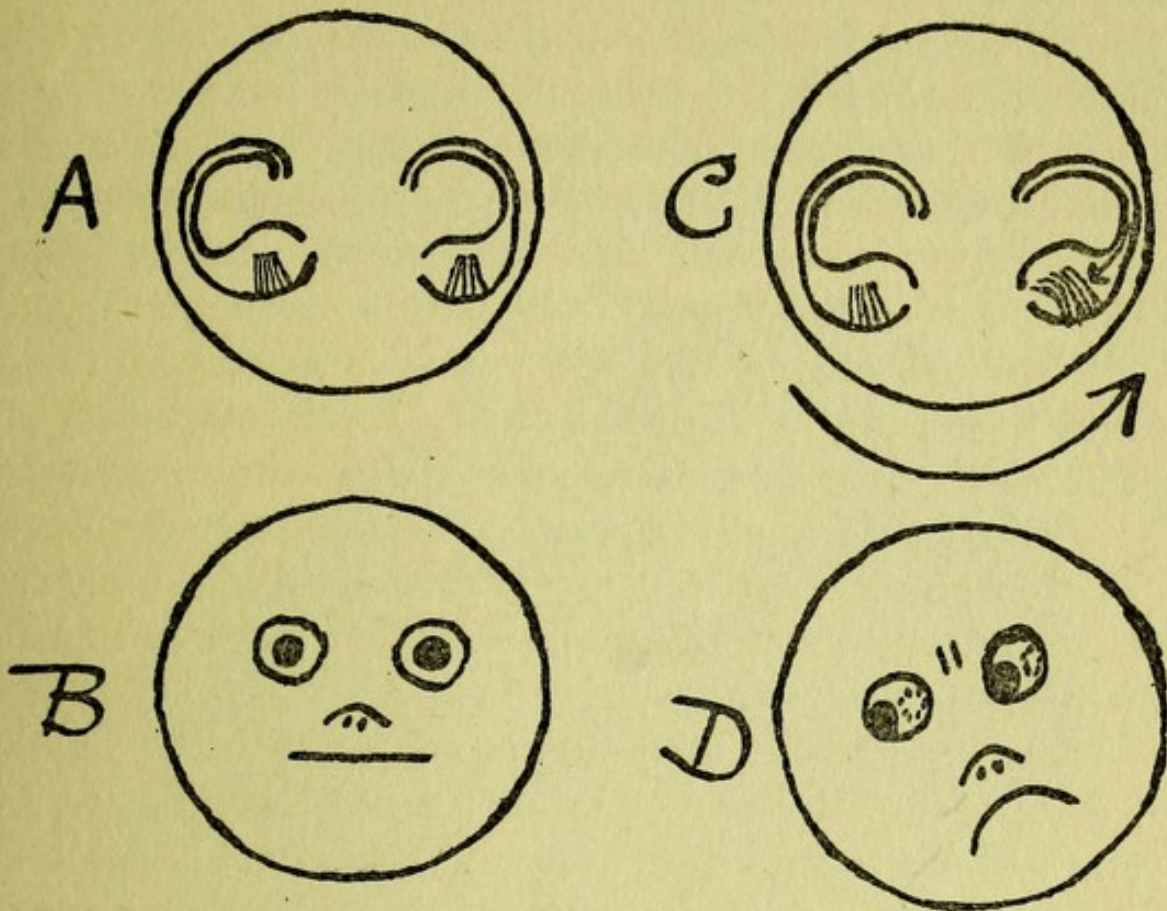
an outer portion, the *semicircular canals*. The vestibule and semicircular canals contain the sensory end organs of the vestibular nerve or nerve of equilibration. The cochlea contains the sensory end organs of the cochlear or true nerve of hearing.

The semicircular canals are three elongated narrow spaces tunnelled through the substance of the temporal bone. Each canal is bent upon itself so as to form a half circle, and has one dilated end called the ampulla. The interior of the semicircular canals is occupied by a membranous replica of the bony canals which is filled with

fluid called endolymph. Projecting into this fluid at the ampullary end of each canal are found numerous delicate hairs or fine bristles. These hairs are part of the hair-cells or sensory end-organs of the vestibular nerve. Sudden movements of the head, e.g., bending over, by altering the pressure of the fluid against the hairs in any given canal, bend them, evoking, automatically, the precise amount of muscular contraction necessary to maintain the body's equilibrium in the new posture. When the erect posture is resumed appropriate readjustments are again made automatically in a similar manner, so that the muscles pulling on each side of the head and trunk exactly counterbalance each other and equilibrium is maintained.

The semicircular canals are so constructed that circular movements of the head (rotations) affect the hairs projecting into their interior. But every rotation of the head does not affect the hairs within each of the three canals simultaneously. In general it has been found that rotation in any given plane of the body affects the hair-cells within that canal, or pair of canals, whose plane most nearly corresponds with the plane in which the head is rotated, for each of the canals corresponds closely with one or other of the three fundamental planes of the body.

The vestibule is a bony compartment connecting the cochlea with the semicircular canals. Its cavity is directly continuous with the hollow interior of the semicircular canals and cochlea and the fluid (endolymph) filling the membranous structures within it, viz., the utricle and saccule, directly communicates with that which fills the membranous semicircular canals and cochlea. The hairs projecting into the interior of the vestibule are collected together at two points called the acoustic spots. These hairs are shorter and stiffer than the hairs in the semicircular canals, and resting upon their free ends are small



DIAGRAMS SHOWING HOW ROTATION OR THE MOVEMENTS OF A SHIP TEND TO CAUSE REFLEX DISPLACEMENT OF THE HEAD AND EYES AND WITH THESE, DISTURBANCES OF EQUILIBRIUM VERTIGO, NAUSEA, ETC.

A and *C* represent imaginary transverse horizontal sections through the head and the horizontal semicircular canals. In *A* the subject is at rest. In *C* he is just beginning to be rotated from right to left, as indicated by the large arrow. *B* represents the position of the head and eyes with the semicircular canals and their hair-cells in a state of rest, as depicted in *A*. In *C* the hair-cells in the left horizontal canal are slightly bent in the direction from the canal toward the ampulla by the tendency of the endolymph to flow in the direction of the small arrow. This causes reflex displacement of the head and eyes toward the right, as shown in *D*. The dotted pupils in *D* indicate the short nystagmic movements to the left.

masses of material called *otoliths* (ear stones) which bend the hairs when the posture of the body is changed, or the head moved abruptly in certain directions. It is believed that only rectilinear movements of the head affect the hairs in the vestibule whilst only movements in a circle,

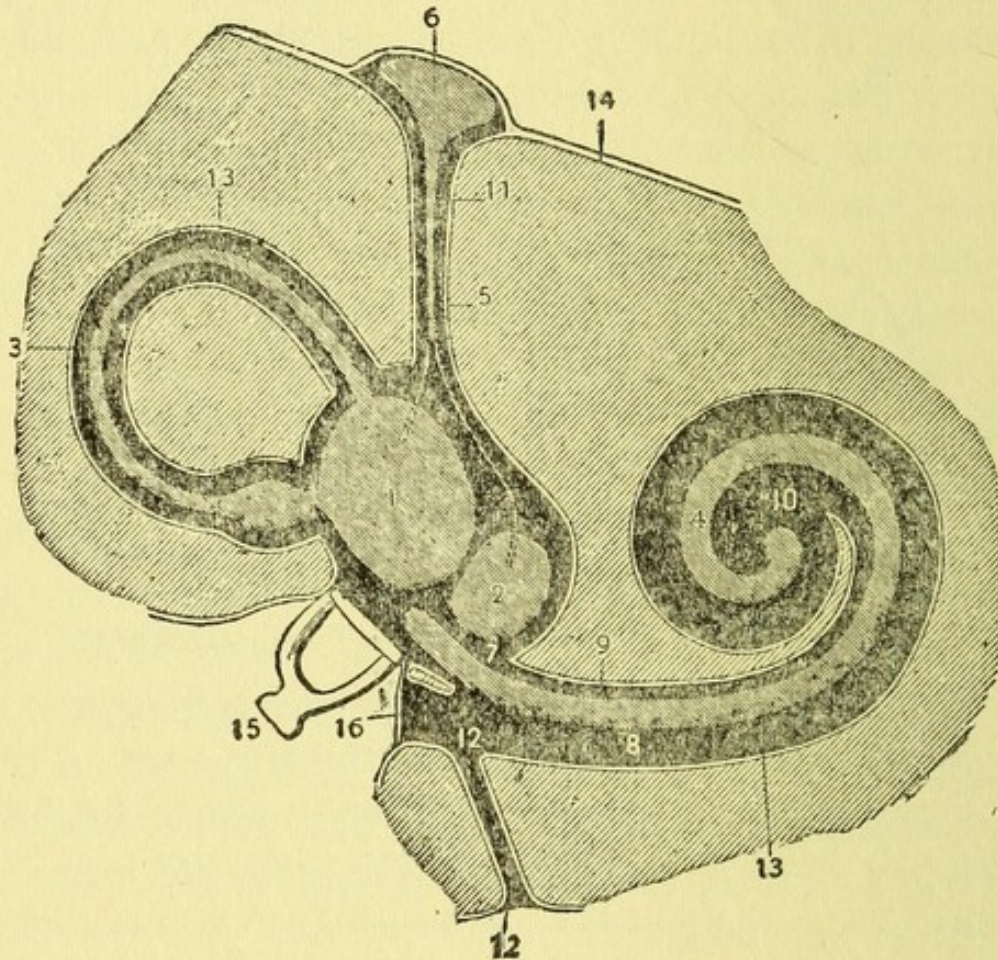


Diagram of the Perilymphatic and Endolymphatic Spaces of the Inner Ear. (Testut.) Endolymphatic spaces in grey; perilymphatic spaces in black. 1, Utricle; 2, saccule; 3, the horizontal semicircular canal; 4, the canal of the cochlea; 15, stapes in fenestra ovalis. The figure is supposed to represent a horizontal section through the labyrinth or internal ear.

i.e., rotations, affect the hairs in the semicircular canals. It has been shown, however, that circular as well as rectilinear movements can affect the hairs in the vestibule, weighted as they are at their free ends with their otoliths. The interest of this point lies in the fact that the vestibule as well as the semicircular canals may be involved in the

causation of seasickness although the movements of the boat which are responsible for seasickness are mainly circular. However, as the hairs in the semicircular canals are longer and more delicate than those in the vestibule, it may be accepted that the semicircular canals are the parts most readily affected in ordinary attacks of seasickness.

It may seem strange that movements such as those of a ship at sea should chiefly affect the sensory endings of a particular nerve. In the case of seeing and hearing, however, light and sound waves, and those only, under ordinary circumstances, stimulate the nerves involved. It is nothing unusual therefore to have displacements of the body act exclusively as the natural stimulus for the vestibular nerve. And here it may be remarked that the sensory end-organs of the vestibular nerve are quite as delicate and sensitive in their own way as those of the nerves of sight and hearing, and can be excited by chemical and mechanical means as well as by heat, cold, electricity and (when exposed) even by light itself.

The vestibular nerve carries impulses from the internal ear to the cerebellum which is the main central organ controlling the body's equilibrium and the automatic movements of the eyes. The nerve also carries impulses directly or indirectly to important centres, which, through the pneumogastric and other nerves, control, to a greater or less extent, the organs of digestion and those of the circulation, viz., the heart and blood-vessels. Hence prolonged and irregular stimulation of the sensory end-organs of this nerve, such as may be caused by the rolling and pitching movements of a ship at sea, readily produces disturbances of equilibrium with giddiness or vertigo, nausea, vomiting, pallor, headache, abnormal sensations within and about the head, mental and physical depression and the other well-known symptoms so commonly associated with seasickness.

Here it may be remarked that all the symptoms of seasickness can be evoked by irritation of the semicircular canals, either directly as in experiments upon animals, or indirectly, as the author has done, by rotating subjects in a swing; by irrigation of the ears with hot and cold liquids; and by galvanic electricity applied over the region of the semicircular canals. Hence gross concussion of the organs cannot be the cause of seasickness, since in irrigation of the ears and in galvanic irritation of the semicircular canals all the symptoms of seasickness were produced with the patient sitting absolutely still. Moreover, deaf-mutes, that is, persons who were deprived of their hearing at or soon after birth, on account of destruction of the sensory end-organs of the internal ears by disease, are immune from seasickness as well as from rotation sickness and the sickness induced by irrigation of the ears and by galvanic electricity. It has been found also that animals in which the vestibular nerves have been destroyed, or the internal ear removed, are likewise immune from rotation sickness as well as from the effects of galvanic irritation. The evidence therefore on the positive and negative side all points to the internal ear, and especially to the semicircular canals, as the original site of irritation in the causation of seasickness.

The movements of a ship at sea which are most effective in causing seasickness are the pitching and spiral movements. The latter form of movement consists of pitching with an element of twisting on the vertical axis added. Rolling movements are not so effective in causing seasickness on account of the slowness with which the reversals of direction take place in these movements. When a subject was rotated in a swing it was found that so long as he was turned through space at a uniform rate of speed he experienced no sickening effect; but if the turning movement were commenced or checked suddenly, or if it were

suddenly retarded or accelerated, the subject was immediately made sick. In seasickness it is in the sudden reversals of direction at the beginning and end of each circular movement of the boat that the most sickening effect is experienced; and it is in the pitching and spiral movements that the reversals of direction are the most sudden and violent. Hence the effectiveness of these movements in causing seasickness.

When once disturbance has been initiated through the semicircular canals various secondary causes come into play. It is in this way that odours, the use of the eyes as in reading or looking at the passing waves, disagreeable sights and sounds, the taking of food, an emotional train of thought, or, in fact, the slightest mental or physical effort can become a source of distress. With regard to the use of the eyes it may be remarked that the centres governing the ordinary or automatic movements of the eyes are located in the cerebellum and in direct connection with the sensory end-organs of the vestibular nerve in the semicircular canals. The other factors, such as disagreeable sights, sounds and odours, the taking of food, etc., become sources of disturbance through the increased irritability (lowered threshold value) of the nerves related to these functions such irritability being caused in the first instance, and maintained in great part, by irritation of the sensory end-organs in the semicircular canals.

The influence of the imagination in causing seasickness has been much exaggerated. Undoubtedly one meets cases in which the imagination seems to play an important part. It must be remembered, however, that in every case of seasickness the brain functions are disordered to a greater or less extent. In many instances the mental processes are so hampered that the thoughts are no longer held within normal bounds of restraint and there ensues a state of mental anarchy which brings the individual close to the

borderland of temporary irresponsibility and insanity. In such conditions the imagination of course plays an important part. Indeed it may be stated once and for all that the imagination always has a marked influence upon patients suffering from seasickness. It must be understood, however, that in every instance it is the disturbed mental condition caused, in the first instance, by irritation of the semicircular canals, that opens the way for the disordered imaginings and makes it possible for them to become sources of disturbance and distress. Of course one disagreeable experience with seasickness may so affect certain individuals that ever afterward the mere thought of going to sea would suffice to make them seasick. From this, however, it cannot be argued that the imagination is the primary cause of seasickness, for such cases as these are, at best, exceptional, and can be traced to impressions retained subconsciously or otherwise but received in the first instance during an actual attack of seasickness, or some disagreeable experience of a related nature. It is in cases like these that hypnotism and suggestion are so effective in preventing and curing seasickness. It does not follow, however, that because hypnotism and suggestion are effective in such cases that they would therefore be equally effective in the prevention and treatment of genuine seasickness of immediate physical origin.

At moving picture shows susceptible individuals may experience symptoms of seasickness, especially when the pictures represent such scenes as a boat rising and falling upon huge waves. On such occasions the author has felt the floor of the theatre sink beneath him, just like a ship dipping into the trough of the waves, and with the same sickening effect. At first sight this would seem to be an instance in which seasickness might be induced solely through the eyes. Such is not the case, however, for although it is theoretically possible for symptoms like those

of seasickness to be evoked by powerful, irregular stimulation through the eyes, yet this is by no means the regular way in which seasickness is caused. The illusory phenomena, e.g., the sinking and rising of the floor, etc., as well as the sense of nausea, discomfort, and insecurity might all be explained by the reflex ocular movements (nystagmus) induced by looking at the picture of the tossing waves. Such an explanation, however, is altogether inadequate. The quantitative disproportion between cause and effect is too great, not to mention the remarkable ease and rapidity with which the individual is brought to the verge of sickness. Moreover, the author's eyes are strong, and no amount of looking at moving objects, other than those connected in some way with seasickness, could sicken or disturb him. It is evident therefore that in his case powerful causes operating from within were brought into play. Such causes are the so-called subconscious memories (associations or complexes) derived from previous experience of actual seasickness.

The simplest act we perform has associated with it, on the mental side, certain ideas, emotions, and sensations, whilst, on the purely physiological side, it involves certain nicely adjusted (co-ordinated) activities in the various muscles involved. The various ideas, emotions, and sensations thus evoked by a certain act, tend, after constant repetition of the act, or after a single performance of it under circumstances that strongly excite the emotions, e.g., fright, etc., to become linked together in such a way that ever afterward functional activity of any one of the associated processes is likely to arouse the remaining processes to activity. Such a linking of functional activities is known as *complex formation*, and the group of processes so linked is called a *complex*. The linking may consist of purely physiological activities as in muscular movements, e.g., boxing, handball, running, piano-playing, etc., where the

complex is the result of education by repetition of the acts. On the other hand the linking may be almost entirely of psychical activities, e.g., association of ideas, etc. This linking of functional activities lies at the root of education, both physical and mental, and is identical with habit formation.

In seasickness the distressing symptoms evoked by continued repetition of the boat's movements form an enduring complex of a disagreeable nature. And since abnormal activities of ocular functions, of a certain definite kind (nystagmus), form an important member of the associated group of symptoms, it is not strange that similar ocular activities, evoked by looking at motion pictures of a boat rising and falling with the waves, should rouse to activity the other associated symptoms of the complex, viz., the sinking of the floor, sense of nausea, etc.

The moving picture show is not without its prejudicial effect upon the community. The emotional excitement, the constant riveting of the attention, and the continued abnormal straining of the eyes are all bad for people in general, and especially for children. The young mind is not sufficiently developed to enjoy the entertainment supplied by the average moving picture show with any possibility of benefit. Bringing children to such shows is very much like picking up a baby out of sound sleep to kiss and pet it, and to talk fool jargon to it, with the expectation that it will appreciate what only grownups can understand and enjoy. And then to think of children coming out of school and going straight into the dirty, stuffy atmosphere of a theatre, to use up the last remnant of their reserve nervous energy in a useless riot of emotion, instead of going forth to proper exercise and recreation in the open air. But some one will say it amuses the children. Yes, and so would alcohol and other things if they were permitted to have them. The truth of the matter is

that the most important thing for the youth or child to learn is control of the emotions, and this they will never acquire at moving picture shows.

When properly supervised and conducted, moving picture shows are a great source of enjoyment for the masses. Unfortunately, as at present conducted, there is very little benefit derived from them in the way of education. In looking at motion pictures, visual impressions are hurled at the mind in such rapid and diverting sequence that there is scarcely any opportunity for the enjoyment of the associated emotions which any particular scene or situation may call into activity; and there is certainly none for such analysis and proper coordination (complex formation) of them as would enable one to make them a possible basis for useful future action. In this respect motion pictures are far behind music, which, on account of its essential indefiniteness, offers no restriction of imagery, but leaves the mind free and unhampered to enjoy at its own leisure and to the fullest extent, treasures of its own making, garnered from the experiences of a lifetime.

To enjoy good music it is not at all necessary to have technical training, any more than it is necessary that one should have an intimate knowledge of the chemistry of food and drink in order to enjoy them. And indeed it is quite possible that technical training may prove a handicap and hindrance to getting the greatest possible enjoyment out of a musical performance, inasmuch as it may restrict the imagery and play of the emotions, by pinning the attention chiefly to technical analysis of the orchestral effects. But of course much depends upon what is uppermost in the mind of the listener. With the student of music, that thing is likely to be technique of composition, interpretation, and execution, whilst with others it is usually something altogether different. In any event the benefit and enjoyment to be derived from listening to

music depends to a great extent upon what one brings with him to the feast. The same is true of poetry and art in general.

In motion picture shows there is restriction from the first, and the mind is, of necessity, tied to what the eye sees, and in such a way that the general emotional exaltation is purposeless and devoid of possible benefit to the observer. Such emotional dissipation is distinctly harmful, as it impairs mental vigour and individuality. And here, perhaps, is to be found the greatest objection to the moving picture show, viz., that in the building of character it tends to substitute the *chic* superficialities and trivial inanities of stage-life for solid home training which properly insists upon due appreciation of life's sober responsibilities and of its purposive end.

In a broader sense the same is true of city as opposed to country life. The ever-varying panorama of trivial events, and the multitudinous jarrings from contact with individuals and their numberless petty interests and cares are fatal to that abstraction and concentration which solitude and the inherent peace of Nature inspire. Thus in the country one is free to follow the trend of his own thoughts and to live his own inner life, whilst in the city one is forced, to a greater or less extent, to live the life that is thrust upon him from without by all sorts of distractions and intrusions.

Emotional exaltation attending the pleasurable stimulus of music may, and should always, be turned to useful account. I have known students to solve difficult problems whilst listening to a Beethoven symphony. Sacrilege, some will say. Not at all. Beethoven himself had little regard for set rules and conventions when these hampered the free expression of himself and his moods through his music. The student therefore may legitimately utilize the state of mental abstraction induced by music, and give

his mind free play among the thoughts and associations that are dearest to him, in the hope that, like Beethoven, he may externalize and perpetuate himself in his work. This is the very essence of art, viz., the externalization of the best that is in us. It is, moreover, the keynote of happiness which springs chiefly from the effective application of our faculties. In work, therefore, lies the secret of contentment, and it does not matter so much what the nature of the work may be, so long as it is not immoral, and is adapted to the capacity of the individual; for whether we play for marbles or millions, the thing is to play the game fairly and squarely, and for all we are worth. The prize is not what brings happiness, but the application of our faculties in such a way as to win it if possible. The prize is a mere symbol; the work itself is the thing.

With such opportunities for work about us it seems a wonder that any one is unhappy in this world. Edison has said that work has made a paradise of earth for him. We are not all Edisons, however; but it is fair to say that our work is waiting for us somewhere if we have the energy to look it up and take hold of it. That work, when found, may consist of deftly handling a pick and shovel, or of skilfully wheeling a heavily laden barrow over a narrow plank, or of carrying a heavy hod of mortar or a sack of wheat, up an inclined stage that sinks and rises in unison with the well-timed movement of the carrier's supple limbs, or of dexterously tying a knot that will not slip, or of painting a beautiful picture, or of composing a grand opera, or of commanding an army, or administering the affairs of a nation. And what matters which of these occupations call us so long as the work is done honourably and well, and satisfies our inherent instinct for workmanship. The practical point is for each to find his work. The struggle to find our work is of course work in itself, and like all other work, it must be done well. Industry and applica-

tion are necessary here as elsewhere. Constant longing and sincere desire will in the end inevitably bring opportunity. But we must know what we want. *Ignoti nulla cupido*. There is no desire for what we know not of. In doing this work of planning out our programme mental abstraction is of the greatest help; and the abstraction, coupled with emotional exaltation, that comes with music affords a splendid opportunity for review and rearrangement of the thoughts that most nearly concern us.

It is only by such inspection and regulation of our thoughts as they pass in review before us that listening to music becomes profitable; for without coordination and regulation of some sort the exaltation that accompanies music, whether this be a Beethoven Symphony or the rattle of a tom-tom, is no more than emotional debauch, not a whit better and no more productive of profitable results than the mental debauch that follows alcohol.

Recovery from seasickness takes place by adjustment and adaptation of the nervous centres in direct relation with the vestibular nerve, so that the individual becomes gradually accustomed to the range and rhythm of the movements of the particular boat on which he is travelling. In this way the abnormally irritated sensory end-organs in the semicircular canals are brought into more or less harmonious accord with the mechanisms involved in digestion, equilibration, etc., so that they no longer cause distress by hampering these functions. Any sudden alteration, however, in the rhythm of the boat's movements, such as occurs when a change is made from a larger to a smaller vessel, or upon the advent of a severe storm, may cause a relapse and a return of all the symptoms. Sailors who had become thoroughly accustomed to the movements of their own ship have been known to become violently seasick when they went to sea upon a smaller vessel. It is a rule, however, that in changing from a smaller to a larger

vessel a person incurs less danger of becoming seasick than in changing from a larger to a smaller vessel. Hence travellers may escape seasickness, or recover from it, on an ocean liner and become stricken almost immediately on being transferred to a Channel steamer; whereas if they are immune upon a Channel steamer they are not likely to be made sick on an ocean liner

CHAPTER IV

THE PRESENT METHODS OF TREATING SEASICKNESS UNSATISFACTORY; OPPORTUNITY FOR PHILAN- THROPISTS

The present methods of treating patients suffering from seasickness are so unsatisfactory that they are a reproach to the medical profession. The victims of seasickness are sadly neglected, but the fault does not lie wholly with the profession, for without a thorough understanding of the causation of any given malady it is extremely difficult to find effective means of treatment. Up to the present time nothing has been definitely known, or scientifically proven, regarding the causation of seasickness, but now that the ground has been fairly cleared it is to be hoped that medical schools and colleges will take up the matter and give suitable courses of instruction not only on the causation and treatment of seasickness, but also on the effects of the malady upon the various organs in health and disease. This seems a necessary step, so that physicians in general may be in a position not only to judge, in any given instance, whether a sea-voyage is advisable or not, but also to prescribe the form of treatment which will best insure comfort and safety in each particular case.

A few years ago, to my own personal knowledge, a celebrated European specialist ordered a patient suffering from serious organic disease of the heart to take an ocean trip to Norway at a time when the most unfavourable conditions for sea travel prevailed. The unfortunate man was dreadfully seasick during the whole trip and barely escaped with his life. A short time after this ill-advised

trip he died at a comparatively early age, and in my opinion the rough usage to which his heart was subjected on that voyage had much to do in hastening his final break-down and death. If advice such as this is given by eminent specialists what may people expect from the rank and file of the profession?

It is the conviction of the author that every physician should thoroughly understand the effects of seasickness, immediate and remote; and that every ship surgeon should have special training in the methods of studying and treating this malady before he assumes the responsibility of caring for a ship's passengers and crew. Furthermore, it is a question whether one medical man can properly look after the needs of one or two thousand people, especially where hundreds of these, including perhaps the doctor himself, are liable to come down sick at the same time. Under the latter circumstances some of the sufferers would certainly be neglected. But some persons may object, saying that they have frequently crossed the ocean and that the ship's surgeon never seemed to be very busy, but that, on the contrary, time seemed to hang heavily upon his hands. The fact is, however, that there is so much for a ship's surgeon to look after that he could never think of doing a fraction of the work properly and so he does just what barely suffices to meet his gross responsibilities. Moreover, the salary of ship surgeons is so small that it is not likely to make competent men lose any sleep thinking over plans as to how they can best acquit themselves of their duties. See "Remuneration of Ship Surgeons" in Appendix. With a capable man at the head of a properly organized staff of assistants and nurses, the opportunities afforded for study on any of the large ships would be so great that the position of assistant ship surgeon would be eagerly sought by young medical men of the very best class and at a nominal salary. The author feels confident that

the benefits accruing to passengers and ship companies alike would soon make themselves felt and justify the additional outlay entailed by the creation of a more efficient medical staff. As matters now stand if a serious accident occurs on a ship, and the necessity of performing a major operation arises, the surgeon has to call upon some fellow medical man who happens to be travelling upon his ship. These two men, unaccustomed to each other's methods, one of them in absolutely strange surroundings and handling unfamiliar instruments, have to do the best they can to perform the operation with the utmost *cleanliness, thoroughness* and *rapidity* if they are to serve the best interests of the patient. With a properly trained staff operations at sea could be undertaken with comparative safety, and they would not be so likely to be deferred until there is little likelihood of recovery, as they are under existing conditions.

Another thing that is objectionable in the modern ship is the location of the hospital, which is usually in the stern just over the propeller, where the motions of the boat are at their greatest, and the vibration from the machinery, especially when the propeller leaves the water, has a most distressing, sickening effect. In any case of serious illness removal of the patient to such a hospital would materially diminish his chances of recovery. When a cabin passenger is taken down with a contagious disease, he is usually isolated in one of the cabins, but when a steerage passenger, or a member of the crew is stricken, he is removed to the hospital in the stern, on a lower deck, where there is the added discomfort of poor light and ventilation.

Making every possible allowance for difficulties which tend to make ideal treatment an impossibility, the author believes that on the modern passenger steamer, steerage passengers and the members of the crew, including firemen, etc., do not receive proper medical attention accord-

ing to present standards of civilization and knowledge. The sick and ailing, even though they be those of humble state who have been handicapped from birth by lack of opportunity in matters of education, need a little more consideration from the physician than the farmer expects the veterinary surgeon to show his horse. Every one of these human beings has a mind that clamours for information as to the nature of his ailment, its dangers, and the probable outcome. A mere prescription for this or that kind of medicine does not meet the requirements of the case and the physician who merely prescribes automatically without even taking the trouble to *appear* interested falls far short of his duty to himself and his profession, as well as to our common humanity.

As an instance of the medical attention the crew get, I relate the following personal experience. Some years ago, when crossing the ocean, the ship's surgeon, who had but recently graduated with high honors from a British University, requested me to look over a member of the crew with him. The man, who was a stoker, had been complaining for some time, and had a moderate degree of fever. He was undoubtedly suffering from incipient pulmonary tuberculosis and appeared quite unfit to work. I advised the doctor to order him to bed for a short time, believing the rest would help him. A few days afterward, as the doctor and I were conversing on deck, I asked him how his patient was doing. The doctor shook his head. I was surprised and inquired if the rest had not been of any benefit. The doctor smiled, and replied that the patient had had no rest as he had to work full time. "Work full time!" said I in astonishment. "And pray what are you here for if not to have your orders obeyed?" "My dear fellow," replied the doctor, "I am not here to order such fellows as that to bed but rather to see that they *stay out of bed and keep at their work*. The ship has got

to be kept going, you know. These are my instructions." And with all our boasted progress these things are possible in our much acclaimed twentieth century! On another occasion, as I sat in the smoking-room after dinner, a stoker, wailing and crying in the most heart-rending manner, came running along the main deck in search of the doctor. It appeared that his brother had been overcome with the heat at his work, and had just been brought on deck unconscious. When the doctor arrived on the scene he manifested such indifference that some of the cabin passengers present got up a petition to the captain complaining of the physician's apparent neglect of the unfortunate man.

I am informed that stokers as a class are very careless in their habits, and much given to overindulgence in alcohol, which renders them unreliable and very difficult to manage. As their work is arduous and carried on under the most trying conditions, it is to be regretted that they cannot be made realize what a difference it would make to them if they only took proper care of themselves, say such care as the average athlete must take of himself if he wishes to make any kind of a showing in his particular line. Efforts have, of course, been already made in this direction, but paternalism, whether under the auspices of religious or purely social organizations, will never appeal to these brave huskies. The first step should be to make them realize the importance of their work, which only men of the very best physical endowments are fitted to perform. Starting from this point, it would be easy to inculcate a spirit of pride in their work and the splendid physique which enables them to perform it. From this it is but a step to make it a pleasure for them to take proper care of their bodies, just as athletes ordinarily do. Unfortunately the carrying out of such a scheme involves a clash of interest on the part of employer as against the employee; and so long as such clashes stand in the way of the better-

ment of the less fortunate portion of humanity, progress must necessarily be made slowly, the readjustments coming, bit by bit, as at the sword's point the worker, inch by inch, fights his way toward emancipation. The question of bettering the condition of these men, like so many other important social questions, needs further scientific and experimental study before the real remedy can be found. In the meantime, it is sad to think of the numbers that drop out of the ranks of the living on almost every long ocean trip. I have known as many as three firemen to die on a single short trip across the Atlantic.

It is strange that in these days of gigantic philanthropy no one has thought of attempting to alleviate the distress and hardship incidental to sea-travel. Of course much has been done to alleviate the frightful conditions that obtained at sea some years back, but in spite of all that has been done it is safe to say that at the present time no other field offers such opportunity for relieving, on a large scale, human suffering and misery. The first step in this direction should be the proper education of physicians as to the true nature and causation of seasickness and the proper methods of treatment. For this purpose philanthropists might, to good purpose, endow medical schools and colleges so as to enable them to give instruction to all students on these important matters. The next step would be the organization of a proper medical staff for every ship going to sea. Provision should be made for supervision and inspection of the work done by these staffs, so that the attention given to the passengers and crew should not degenerate into mere routine. With the establishment of proper medical staffs the influence of new men and new ideas would soon make itself felt in improved hospital facilities, in the collection of statistics as to death-rate, etc., from seasickness and other causes, and above all in the better and more systematic methods of caring for the sick and suffering at sea.

CHAPTER V

GENERAL OUTLINES OF TREATMENT IN SEASICKNESS

The consideration of first importance in the minds of those interested in the treatment of seasickness, is: Can the malady be prevented? The answer is that in the vast majority of cases it can, and where it is not absolutely prevented, its course can be so modified by judicious treatment, that the sickness is stripped of its terrors. The chief measures to be employed in the prevention of seasickness include general hygienic precautions preparatory to the voyage, such as mental quiet, attention to the condition of the stomach and bowels, and the use of certain medicines. For the details of this treatment see Chapter VI.

No individual who has reason to believe that there is anything wrong with his vital organs, and especially with his heart, should go to sea without having first had a thorough examination by a competent physician. A knowledge of the condition of these organs is essential in determining the advisability of a sea-voyage, and the time of the year it should be undertaken. Such knowledge is, moreover, of considerable help in determining the general care that should be given the individual, while he is on board in order to avoid, as far as possible, the risk of injuring these organs or of hastening the disease process and thereby shortening life.

The size and location of the cabin and, above all, the facilities for ventilation, have an important bearing on the prevention of seasickness as well as upon the treatment of an actual attack. The avoidance of hurry and

worry before going on board has an important influence in preventing the malady, whilst during severe attacks rest in bed has been justly advocated in all times. The regulation of the diet before going on board and during the first part of the voyage is an all-important consideration which is discussed in detail in Chapter VI.

Hypnotism has been tried with varying success in the prevention of seasickness. In those cases of seasickness where the psychic factor (imagination) seems to predominate hypnotic suggestion is undoubtedly of benefit. It has to be admitted, however, that in the vast majority of cases of seasickness the psychic element is, at best, but one of the secondary sources of distress. Moreover, many people are unwilling to be hypnotized and many others cannot readily be put into hypnosis. It is also a fact that the effect of hypnotic suggestion soon begins to wane, so that the hypnosis would have to be repeated, say, on the first or second day out, and this might entail difficulties which could not be readily overcome. All this, however, does not mean that ordinary methods of suggestion and auto-suggestion should not be utilized to the utmost extent in the interests of prospective and actual travellers. Suggestion is a potent means of relieving the psychic distress that accompanies seasickness, and it should be made the most of, under all conditions and at all times, in the prevention and treatment of seasickness.

Various mechanical devices have been invented from time to time for the prevention of seasickness. In 1873, J. A. Chomel devised an "oscillating berth." In 1875, J. Michel constructed a "swinging berth," and in 1882, J. C. Thompson a "self-levelling berth." All these earlier devices, which depended mainly on the principle of suspension or support by means of a universal ball-and-socket joint, were, for some reason or other, found to be inefficient.

In 1904, G. O. Schlick and Thomas C. Forbes, independently of each other, applied the principle of the gyroscope in attempting to restrain the motions of ships at sea. Forbes used a large horizontal fly-wheel, which was located in the hold, where it was made to rotate rapidly about a fixed axis. In the interests of those unfamiliar with the principle of the gyroscope it may be stated that when a heavy wheel is made to rotate rapidly in any given plane it will forcibly resist being tilted out of that plane. This is simply another way of expressing Newton's first law of motion, viz. : A body in moving in any one direction tends to keep on moving in that direction. It is the practical application of this simple principle that has made it possible for cars to be balanced upon a single rail in the modern gyroscopic or monorail system of railway.

Recently the principle of the swinging-berth or compartment has been combined with that of the gyroscope. An English lady of rank has equipped a swinging-berth with gyroscopic wheels. This combination seems to hold out the greatest prospect of reducing to a minimum the effects of the boat's motions upon the traveller. Every ship should carry some such contrivance which would afford the most advantageous conditions for the performance of serious surgical operations at sea, and give patients, reduced to the last extremity by seasickness, a life-saving respite from their sufferings.

Recently Heinrich Frahm has devised a system of tubes or tanks to prevent the rolling of ships at sea. The system consists of a series of large chambers situated on each side of the ship, and so connected by narrow communicating tubes that water can flow from each tank on the port side to the corresponding tank on the starboard side, and *vice versa*. One tank is filled with water, the flow of which to the opposite tank is so controlled by a throttling air-valve placed above each tank, that when there is a ten-

dency to roll to the starboard, there will be enough water in the port tank to steady the boat. In a similar manner, the rolling of the boat to the port-side is checked by water retained in the starboard tanks. The efficiency of these tanks was tested on large passenger ships and it is reported that they reduced the rolling motions by at least 80 per cent. Unfortunately, however, rolling is not the movement which is most effective in causing seasickness on large vessels at least, and what is needed most of all is a device to prevent the pitching and spiral movements. It is not necessary that such a device should absolutely prevent these movements. It would be sufficient, if the sudden stops and starts which occur at the end and beginning of each movement could be eliminated or partially restrained, as it is these that are mainly responsible for seasickness.

In the treatment of a severe attack of seasickness, the problem resolves itself into offsetting or neutralizing the effects of repeated stimulation of the sensory end-organs of the internal ear, upon the brain and nerves and, through these, upon the organs of the circulation, digestion, equilibration, etc. The methods employed include a thorough study of the individual's circulation, especial attention being given to the condition of the heart and blood-vessels. The blood-pressure should be taken at frequent intervals, and if there be marked evidence of failure of the circulation, absolute rest in bed should be insisted upon until the patient has convalesced to the point where he can relish his food. Under no circumstances should the patient be allowed to walk about or climb stairs before he is able to take and retain food, as, by doing so, there would be grave danger of injuring the heart.

Absolute abstinence from food for a short period is also advisable. When the condition of the stomach permits it, food should be gradually resumed. It is important

that food should not be resumed too early, nor withheld too long. It is frequently of great benefit to wash out the stomach before entering on the period of abstinence. The best method of doing this is described in detail in Chapter VI.

The temperature and freshness of the air in the cabin are matters of the greatest importance. The cabin should at all times be kept well ventilated and cool. If necessary, artificial measures should be resorted to for this purpose.

As a rule, cold bathing does not benefit persons suffering from seasickness, and as recovery progresses, the cool or cold tub must be resumed gradually and carefully, even by those habitually accustomed to it.

Various drugs and measures have been used from the most ancient times in the treatment of seasickness. In his experimental studies, the author tested the efficacy of numerous remedies, some of which have long enjoyed a reputation for curing and preventing seasickness. Though in most cases the results were very disappointing, two or three drugs were found to have a really marked effect in preventing seasickness and controlling the attack. The doses and mode of administration of these drugs, together with other necessary instructions, are given in detail in Chapter VI.

The location of the cabin is an important factor in treating seasickness. If possible, a cabin should be selected which is located amidships and on an upper deck, so that the portholes can be kept open constantly. If the patient's room be poorly located, and if conditions otherwise permit it, he may remain on deck and be treated there. However, passengers as a rule are not allowed to remain on deck all night, and it is both disagreeable and risky for those who are seriously ill to make the efforts necessary to come on deck.

All secondary sources of irritation should, as far as

possible, be eliminated. Disagreeable sounds and odours, and all obnoxious sights should be avoided. Above all, the patient should not attempt to read or try to look at moving objects such as the passing waves. The automatic movements of the eyes are controlled to a great extent by the nerves of the internal ear, which, by their irritation are the main cause of seasickness. Patients well on their way to recovery may be sickened by premature use of the eyes. Emotional trains of thought also, as well as concentration of the attention on any subject have a very bad effect upon the disordered brain and may materially retard recovery.

Hypnotic suggestion, where it is feasible, would undoubtedly be of value in relieving some of the distressing effects of seasickness. Ordinary suggestion, however, has a much wider field of usefulness since it is applicable in every case. The chief things to be avoided in the treatment of any serious case of seasickness are:

- (1) Injudicious eating when the stomach is not in a condition to digest food.
- (2) Too prolonged abstinence from food.
- (3) Too early resumption of ordinary food.
- (4) All exertion, mental and physical, during the acute stage and the period immediately following it.
- (5) A hot and stuffy cabin.
- (6) Disagreeable and dismal surroundings.
- (7) Offensive sights and sounds.
- (8) Offensive odours, such as tobacco-smoke and the like.

CHAPTER VI

PRACTICAL HINTS FOR THE PREVENTION AND TREATMENT OF SEASICKNESS

It is not necessary that the traveller should make up his mind beforehand that he is going to be sick. There are various grades of susceptibility, and even though he may have been sick on previous occasions, it does not follow that he will continue to get sick. Frequently, susceptibility to seasickness begins to abate comparatively early in life. Travellers, therefore, should not make themselves sick, or bring themselves to the verge of sickness, by imagination (auto-suggestion) before the journey commences.

If there is reason to believe that the heart is not sound, a sea-voyage should by no means be commenced without taking the greatest possible precautions to prevent damage to that organ. Even though previous experience may have shown that the passenger is not susceptible, it must be remembered that susceptibility sometimes supervenes in persons hitherto immune. The precautions alluded to, include a visit to the physician for the purpose of having the condition of the heart and blood-vessels studied, as well as for general and particular instructions, and perhaps a note to the ship's surgeon explaining the individual's condition.

The digestive system should be in as good working order as possible before the commencement of a voyage. The bowels should be kept open, but violent catharsis should be avoided. The prolonged or frequent use of saline cathartics should be especially avoided. This class

of drugs includes citrate of magnesia, sulphate of magnesia (Epsom salts), Rochelle salts, Seidlitz powders, phosphate of soda, etc., and the various proprietary preparations containing one or several of the saline cathartics such as Apenta water, Hunyadi water, Sal Hepatica, Sal Vitæ, etc. The prolonged use of these articles tends to impoverishment of the liver's supply of stock materials (bile salts) utilized in the elaboration of the bile. The rapid expulsion of the fluid contents of the small intestine prevents the reabsorption of the bile salts, which presumably are necessary for bile-formation, since they are under normal conditions reabsorbed from the intestine and carried back to the liver. The result, therefore, of repeated hasty evacuation of the intestinal contents is the production of bile that is lacking in quantity or quality or both. Long ago it was proved that bile is necessary for the digestion of fats, and as fats are such an essential element of our food, being more than twice as rich in food value as protein (lean meat, etc.) or carbohydrate (starches, sugars, etc.) the loss to the economy through failure of their digestion or absorption may be easily appreciated. Moreover, fatty foods seem to be especially necessary for the maintenance of a normal state of tone in the nervous system. At all events it is well-known to physicians that infants, children and adults whose food does not contain a sufficient amount of fat (cream, etc.) become exceedingly peevish and irritable. The author has seen numerous cases in which nervous prostration (neurasthenia) developed after the prolonged use of saline cathartics taken as the easiest means of relieving (not curing) constipation. The bowels, therefore, if they are in good working order should be left alone. If there is constipation a moderate but sufficient dose of cascara sagrada, or some equally harmless drug, should be taken before meals for a day or two before the commencement of the voyage.

Plenty of wholesome, digestible food should be taken for a few days previous to the journey, so as to store the muscles and other organs with an available supply of energy for the possible days of privation when the stomach will tolerate no food or only a very limited amount. The author knows of a case in which the starvation incidental to a rough passage was instrumental in causing serious damage to a fairly sound heart. It is advisable to take a reasonable amount of rest for a day or so before the voyage, so as to aid in this process of storing energy within the organs.

Suitable cabins (state-rooms) should be selected. The best rooms are those in which the motion will be least and the means of ventilation best. Proximity to the promenade deck, lounge, etc., is another factor of importance, as the climbing of stairs, or other such exertion, is to be avoided as much as possible. It is difficult to find all these requisites in cabins. However, in a general way, it may be said that the motion is least amidship whilst at present the ventilation is best in the outside rooms. The cabins located on the promenade deck, or on the deck next to it, are to be preferred, though theoretically the motion might be a trifle greater than on a deck whose plane runs nearer to the centre of rotation of the ship as a whole in the movements of pitching, rolling, etc. The higher decks, however, have the great advantage that the portholes can be kept open in weather which would necessitate their constant closure upon the lower decks.

The numerous little things which, if left to the last moment, might cause worry and mar the passenger's comfort, must be anticipated as far as possible before the commencement of the journey. Thus, at the time of booking, deck-chairs should be secured and possibly the location on deck. At this time also it is sometimes possible to arrange for seats in the dining saloon. If these cannot

be secured at the booking office it is wise to get into communication at the earliest opportunity with the chief steward, or the person occupying a similar position in the second cabin. In this, as in most other matters, he is the one above all others who has it in his power to make or mar the traveller's comfort. Hence the initiated always make it their business to see this individual at the very outset.

Another thing that will prevent hurry and worry is to have the "wanted baggage" properly labelled with the name, number of the state-room, etc. If this be done, and the baggage has been brought to the pier, or put on the boat, the passenger need not trouble himself further, as the stewards will see that it reaches the proper cabin. The same is true for cabin baggage on going ashore. If it be properly labelled with the initial letter of the passenger's surname the steward will see that it is put down on the pier under that initial. For this purpose the company, at the time of booking, supplies each passenger with stickers each bearing in large type the first letter of the passenger's surname. If this matter has been overlooked on shore, stickers can be procured on board.

Rugs and cushions are a necessity for persons who are likely to become seasick. Indeed they are a great comfort even to passengers who are immune. At present these articles can be rented on most of the large steamers, but for obvious reasons many passengers prefer to carry their own rugs and cushions.

It is advisable to go aboard a short time before the hour of sailing. Passengers will then have time to get their bearings as to the location of the toilets, lounge, dining saloon, deck-chairs, etc., so that after the journey has commenced trips to any one of these may be made as expeditiously as possible, and with the least amount of mental or physical effort.

If there be not a private bath in the passenger's suite, it is well to have the bedroom steward arrange with the bathroom steward for the hour of the daily bath. Instructions should also be given as to whether the latter is to be hot, cold, tepid, etc. This matter should be attended to immediately on going aboard.

Where it is possible, a large steamer should be preferred to a small one, and as favorable a time as possible chosen for the trip, e.g., the summer months. The equinoctial periods, i.e., about the middle of March and September, as well as the winter months in general, are to be avoided as severe storms are apt to be encountered at these times.

For the convenience of travellers and to avoid possible mistakes in dosage and administration the combination of drugs that has been found most efficient in preventing and treating seasickness has been marketed by a New York firm¹ under the name of *Antimermal*. This preparation, which is dispensed in capsules, has been found to be both agreeable and effective. The time to take the first dose is about half or three-quarters of an hour before the vessel starts. It is advisable for the passenger to take a light meal four or five hours before sailing if the meal contains meat; or from two to three hours before sailing if the meal contains no meat. Plenty of time should be taken at this meal and the food most thoroughly chewed. The passenger should be on board about one hour or three-quarters of an hour before sailing, and having attended to the matters above mentioned he should locate his deck-chair and rest, preferably in some quiet spot, where fresh air is accessible. Three capsules of *Antimermal* may now be taken. A small amount of water will suffice to wash them down. After taking the capsules, the passenger should rest quietly

in his chair, no matter how well he may feel, as one of the usual effects of the medicine is to induce a sense of exhilaration and an inclination toward physical and mental activity. In short journeys this treatment will suffice. It is imperative, however, that the medicine be allowed sufficient time for absorption from the alimentary canal before the journey commences.

Many persons can tolerate and may require as many as four capsules, whilst occasionally a person will be found who may suffer slight disagreeable effects from two capsules. The symptoms of an overdose are restlessness and fidgetiness. These symptoms, should they supervene, need not cause alarm as they quickly disappear on stopping the medicine.

Children of seven years may safely take one or two capsules. It is always best to try one capsule first, a day or so before beginning the journey, and if no nervousness, etc., results from this dose the child may safely take two capsules at the commencement of the journey. A child of three may take half the dose for a child of seven. In order to obtain the proper dose, the powder may be removed from one capsule and stirred well into a given amount of water, say one tablespoonful. One-half of the mixture thus made will represent the commencing dose for a child of three. As in the case of a child of seven, the child of three may require the whole contents of one capsule. In that case it is better to try the effect of the smaller dose first and if it is well borne, the dose may be graduated carefully up to the larger dose. Children bear the remedy remarkably well, and can take relatively larger doses than adults.

In children when the maximum dose has been reached, a scarlet flush may appear on the face. The flush is very pronounced and need not cause alarm, but when it appears, the remedy should be suspended at once. If it be neces-

sary to resume the medicine the commencing dose should be somewhat smaller than the dose which caused the flush.

By following the instructions given above, no one need have the slightest fear of using the remedy even in the case of very young children. It contains no injurious or depressing drugs of any kind and no possible harm can follow its use as above outlined.

The passenger, if only slightly affected, should try, if possible, to take food at the regular times from the outset. Beef-tea and clear soups (*consommé*), because of the gastric stimulants (*secretogogues*) contained in them, help in the restoration of the digestive function, especially aiding in the secretion of the gastric juice. If not too ill, that is, where only slight distress is felt in the head, it is advisable for the passenger to try to go to the dining saloon at mealtime. Food only in the smallest amounts should be taken, and it should be thoroughly masticated. Thus a few tablespoonfuls of a clear soup (*consommé*) may be taken with a very small amount of tender meat, preferably roast beef or roast mutton, not too well done, and a little toast or the crust of stale bread. The amount of solid food taken at first should not exceed in all half an ounce. As a matter of fact, food is taken at this time, not so much with the object of nourishing the body, as of stimulating the digestive functions and preparing the stomach for the earliest possible resumption of ordinary diet. Such being the case, only such foods as tend to stimulate gastric secretion should be taken. Foods and liquids which do not contain gastric stimulants (*secretogogues*) or their immediate precursors should be avoided. Hence milk and eggs should be avoided, and, as a general rule, water. And since only concentrated foods are desirable, vegetables should be avoided in the early stages. No time should be wasted at table, although undue hurry is to be avoided. Thorough mastication is

absolutely imperative, and most people will feel better if tea and coffee be let alone at first. When the "meal" is over, the passenger should get to his chair on deck as soon as possible, and lie quietly in semirecumbency, avoiding all mental and physical effort. It is understood, that if the stomach is already sick and causing distress, that it would be madness to go to the dining saloon. In that event the passenger should stay on deck, taking no food whatever, biding his opportunity to coax the stomach with beef-tea, etc. The medicinal substances contained in *Antimermal* do not retard the digestive functions, in fact, each ingredient markedly favours absorption and the onward propulsion of food into the intestine. Upon the results experienced after one or two light meals, as outlined above, will depend the passenger's future course as to eating. The appetite is the great guide, but at first it is better not to gratify it too much. It is best rather to coax it along, ever remembering that prolonged mastication tends greatly to restoration of the digestive functions. As improvement goes on with time, the amount of food may be gradually increased and other varieties added until the passenger is taking ordinary diet.

When food can be taken and retained without distress, the passenger may begin to move about the deck, if the boat be fairly steady. If there be much rolling or pitching, it is better to avoid the exertion incidental to walking about until the boat is steadier or the passenger has gained more strength. Undue exertion may retard recovery or induce severe sickness in persons only slightly affected. Stairs should be climbed as little as possible. The author has seen middle aged persons almost expire after such exertion at sea.

When the aim is to prevent seasickness, or overcome its milder manifestations, the use of the eyes is particu-

larly to be avoided, since the mechanism of the eye movements is intimately related to the sensory end organs in the internal ear (semicircular canals) and is always, in disturbances of the latter, more or less disordered. Hence reading and all close work with the eyes is harmful. For the same reason looking at the passing waves is distressing. A passenger sitting on deck should therefore have his eyes closed, or directed toward something comparatively stationary, such as the horizon. Many persons have the faculty of disregarding objects moving within the field of vision. In a general way such objects are seen as they pass before the eyes but there is no attempt at visual fixation and the eyes are not called on to make any effort. Hence in some individuals the sight of the tossing waves may not prove distressing since there is, on the part of the eyes, no attempt at reflex adjustment and fixation for accurate vision.

Conversation, if it entails any strain, is to be avoided; in fact, anything that involves mental or emotional activity should be avoided until recovery is complete. The music-room, therefore, may not, under all circumstances, be the most desirable place for those of emotional temperament.

As previously mentioned, disagreeable odours, sights and sounds as well as the vibration of the ship's machinery are to be avoided as much as possible. Dismal surroundings and disagreeable companionship should also be avoided.

The best posture to assume on deck is that of semi-reclining in a deck-chair with the back directed toward the long axis of the boat and the feet pointing outward toward the sea. In this posture and position, pitching and spiral movements do not readily affect the horizontal semicircular canals, which have been shown to be the ones most effective in causing rotation sickness, owing perhaps

to the fact that the ampulla of each of these canals is intimately related to the utricle of the vestibule. On the other hand if the passenger, in the position above indicated, were to lie flat, pitching movements would affect the horizontal canals. In the semireclining posture, however, only the rolling movements are calculated to affect the semicircular canals, and the canals affected by these movements are the paired superior and posterior canals.

As, however, these latter are not so efficient in causing rotation sickness, and as the rolling movements in large ocean steamers are seldom of sufficient abruptness to cause marked disturbances in the semicircular canals, the tendency to cause distress or sickness is slight. With the body lying flat on the back and its long axis parallel to the long axis of the boat, rolling movements affect the horizontal canals whilst pitching and spiral movements tend to affect only the remaining canals. Hence the usual position of beds at sea is the correct one for complete recumbency, whereas the usual position of deck chairs is the correct one for semirecumbency.

Slow, rolling movements frequently set in toward the end of a voyage. Such movements are due chiefly to the great consumption of coal with consequent lightening of the ship's ballast. On account of their slowness and rhythm these movements have nothing more than an exhilarating effect. The passenger, therefore, need not get alarmed on seeing the ship begin to roll toward the end of a voyage but should rather look forward to the pleasure of walking on deck if his general condition warrants it.

During the course of the voyage when a passenger is just recovering from seasickness, or just begins to feel his confidence return, if rough weather be predicted, or has already set in, food should be restricted; the passenger should remain absolutely quiet and the dose of *Antimermal* should be repeated at once. If the medicine had been

taken recently, say an hour or so previously, it will not be necessary to take it again before the lapse of three hours; but if the sea be very rough and the passenger feels that he is getting sick, the dose may be repeated in two hours quite safely. The rules above laid down as to the kind and quantity of food should be followed for a short time, but, in general, where a person is on the way to recovery, a slight relapse due to a sudden change of weather, if properly treated, is soon recovered from and causes no serious disturbance. If, on the other hand, the case be mismanaged from the outset by injudicious overeating or too prolonged abstinence, the most serious consequences may ensue from relapses of this kind. In any event food and exercise must be gradually resumed.

For the constipation which is almost certain to occur at sea, cascara sagrada is the safest drug. Of the aromatic fluid extract, one-half to one teaspoonful is a fair dose. If cascara in the liquid form be objectionable, the drug may be obtained in tablet form from any pharmacist. As the passenger's condition improves, constipation tends to disappear, especially with a return to normal diet. At this time the cascara should be discontinued, an occasional small dose, say one-fourth to one-half a teaspoonful of the aromatic fluid extract being taken if required.

It is not advisable to have too much or too heavy clothing about the body in the cabin or upon deck. Enough clothing to keep the body, and especially the feet and legs comfortably warm, is all that is desirable. We depend much upon air-currents, especially in the enforced inactivity incidental to seasickness. These act as external stimuli and evoke vaso-motor and other reactions in the body which tend to restore the tonus of the mechanisms of the circulation and through these the various other mechanisms, e.g., those of respiration, digestion, etc.

Hence the body must not be oppressed by too much wrapping, especially on days when the humidity is high. On such days if air currents be too much interfered with by overwrapping, there is not sufficient provision for the evaporation of perspiration from the skin surface. This adds materially to the individual's discomfort and tends to retard recovery, or even to induce severe seasickness in those only slightly affected. This advice must not be construed as meaning that the unprotected body is to be exposed to draughts, or that proper care is not to be taken to see that the body, and especially the extremities, are kept reasonably and comfortably warm at all times in bed as well as elsewhere.

In very severe cases of seasickness the stomach should be emptied and washed out at once. Owing to the disturbed condition of the organ this is, fortunately, an easy matter. All that is necessary is to have the patient drink one or two glasses of water, warm or cold, preferably with a little table salt and bicarbonate of soda (baking soda) added—say one teaspoonful of each to the pint of water. When the water has been retained for a few minutes it will be readily vomited. If necessary, the vomiting may be hastened by tickling the inside of the throat with the finger, the handle of a spoon, etc. When the vomiting has occurred it is advisable to take another glass or two of the water with the salt and soda added. This should also be vomited immediately so as to remove bile, mucus, etc., from the stomach. This method of cleaning out the stomach is much preferable to the use of the stomach-tube. On account of the congestion and extreme irritation of the stomach violent vomiting may occur at any moment. Hence in passing the stomach-tube there is always grave danger of injuring the stomach-walls and causing hemorrhage, etc. It is hardly advisable to give any medicine by mouth in the height of a severe attack, as it would

probably be vomited. Moreover, the pylorus is tightly closed and very little absorption takes place from the stomach under such conditions. In all such cases medicinal remedies if used at this stage should be administered hypodermically or by rectum. The services of a physician or nurse would be a necessity in that event.

In these severe cases the patient should, of course, be in bed and the cabin portholes open if possible. If this be not permissible, electric fans should be installed and every precaution taken to see that there is a free supply of cool air. The temperature of the cabin should be low and kept so artificially if necessity demands it. Neither food nor medicine (by mouth) should be taken for some time, usually for some hours. The food at first should be liquid and given in very small quantities. At this stage champagne and ginger ale are very serviceable, although small amounts of hot beef-tea are to be preferred owing to the stimulating (secretagogue) action of the latter. If these be retained, and they will be in most instances if *Antimermal* has been properly administered and the patient lies quietly in bed, the amount may be increased gradually, but stronger food should not be given until there is a desire for it, and then a very small amount of tender meat, e.g., roast beef, may be given with toast. This food should be slowly taken and most thoroughly masticated. Again, it is to be insisted that this food is given not so much for the nourishment it contains as to hasten the restoration of the stomach functions. The latter will be evinced by an increasing desire for food. The patient should not be allowed to get out of bed until several light meals have been taken and relished, as otherwise the efforts of getting up and dressing, and above all of climbing the stairs, may seriously overstrain the *starved* and weakened heart muscle.

In prolonged cases of seasickness there is often a cra-

ving for acids and fruit juices. The continued absence or diminution of the acid content of the stomach, and the privation from normal food, accounts in part for this and it is highly proper to satisfy such a craving providing due care is taken not to add to the stomach's distress by taking too much juice, or the juice of unripe fruit, or by swallowing the fibre of the fruit, which is allowable only when recovery is complete.

In extreme cases of seasickness dry cold, such as ice-bags applied behind and about the ears, i.e., over the mastoid areas, will tend to soothe the irritability of the semicircular canals and so help indirectly in soothing gastric irritability. Even in the milder forms of seasickness this procedure will prove helpful.

In severe cases, and indeed in any case of seasickness, even though of mild type, tub baths should not be taken. Even when the patient is well on his way to recovery, it is better to delay the bath for some time until the blood-pressure, vaso-motor reactions, or the patient's own general sense of well-being indicate that the circulatory mechanisms have sufficiently recovered.

Where the attack has been prolonged, and in any case of seasickness occurring in persons suffering from disorders affecting the heart, whether these be manifest or latent, the greatest care must be taken in the resumption of food and exercise. In such cases the period of convalescence from seasickness frequently extends for a considerable time beyond the termination of the voyage. Neglect of these rules may cause permanent damage to the heart muscle and premature final breakdown. In all these cases a close study of the circulatory mechanisms (heart, blood-vessels, etc.) is absolutely imperative, as it affords the most reliable means of judging whether exercise be permissible or not.

No severe case of seasickness, and in fact no severe

illness of any kind occurring at sea, should be confined to a hospital or cabin situated in or near the bow or stern of the boat; nor should such cases be kept in the steerage, or in fact in any part of the ship where the pitching and rolling motions and the general conditions tend materially to lessen the patient's chances of life or of complete restoration to health. Naturally the question will be asked by the ship's authorities, "Well, where are we to put such patients?" The disinterested medical man can give only one answer. With him the patient's interests come first. Since it is necessary to have a hospital or hospitals on board, these latter should by all means be situated amidships and on an upper deck, where an abundance of light and air is accessible. All sorts of objections will be offered to this suggestion, but the fact remains that the patient's location on board has much to do with his illness, and in severe cases it may be the determining factor of the outcome.

Persons convalescing from severe protracted illness and those afflicted with *heart disease* (not necessarily in the advanced stages), and especially persons who are subject to attacks of *angina pectoris*, should avoid going to sea. If, however, they must travel they should be safeguarded by medical advice, and the greatest precautions should be taken to prevent seasickness, or offset, to the greatest possible extent, the effects of irritation of the semicircular canals. The mental anguish and worrisomeness incidental to even the milder grades of seasickness are exceedingly injurious to such patients. For similar reasons those who manifest signs of mental disorder, or a tendency to insanity, or who are afflicted with *melancholia*, marked nervous prostration, or incurable diseases such as cancer, etc., should not be permitted to travel on sea in rough weather or alone. Such patients often commit suicide at sea.

Seasickness is frequently aggravated and the attack prolonged by injudicious eating. At the commencement of the journey, and sometimes even during the progress of the illness, there is a tendency on the part of travellers to take too much food or food that is improperly adapted to the needs of the occasion. In the height of their seasickness, the author has seen individuals, mostly young women, eat oranges almost immediately after an attack of vomiting. The fibre of the orange is indigestible and its bulk is such that, in the conditions obtaining in seasickness, it is utterly impossible for it to pass out of the stomach into the intestine. It must therefore remain in the irritated stomach where it acts as a foreign body causing great distress until it is vomited. It should be remembered that at the commencement of the voyage the appetite may be increased, but this is generally soon followed by impairment of the digestive functions. Hence care must be taken not to impose too much of a burden on the stomach at this time by overeating. It is much better to err on the side of conservatism in the matter of taking food. A little self-denial of this kind at the beginning would prevent or mitigate to a great extent much of the suffering associated with seasickness. The appetite is a reliable guide ordinarily, except just immediately prior to and at the commencement of the voyage, when food should be restricted as a routine practice. The instincts do not err, but individuals err in interpreting them. Thus when a person suffering from seasickness feels the need of acids and fruit juices it is proper that nature's craving should be gratified, if possible. This is all very well so far, but when the patient eats a whole orange for the purpose, he runs counter to known physiological principles having erred in the interpretation of his instincts which indicated to him the need of acids and fruit juices, but not the *manner* in which they should be adminis-

tered. A similar mistake is made daily by patients and others in a thousand and one ways. Thus an individual may have worked hard all day and neglected to take sufficient water for his bodily needs. On his way home in the evening his instinct warns him that his tissues need fluid, and the first thing that jumps into his mind as he passes the saloon or café is some form of alcoholic drink, whereas the real demand of nature, as evidenced by thirst, is for water and nothing more. Similarly, in cases of acute gastric inflammation, there may be a great demand on the part of the tissues for water when the latter may not be tolerated by the stomach. Here science comes to the rescue and satisfies the cravings of nature by administering the water hypodermically, intravenously or by the rectum, to the infinite relief of the patient.

If, at the commencement of a voyage, the traveller, after eating heartily finds that indigestion ensues, he should rest quietly in his deck-chair or in bed. Lying alternately first on the left side and then on the right often relieves the distress of indigestion in a remarkable manner. After a short time, however, if it be found that the indigestion and stomach distress do not improve but rather grow worse, it is best to empty the stomach at once by drinking water with common salt and bicarbonate of soda dissolved in it, as indicated above. Having emptied and cleansed the stomach, the individual should rest quietly in the open air, or in bed, following the rules laid down in regard to the restriction of food and exercise. When the stomach after being washed out has rested a little while, *Antimermal* may be taken according to the directions given on page 68. In many instances when the stomach has been washed out and food and exercise restricted no further treatment other than a single dose, three capsules of *Antimermal*, will be necessary, as convalescence often sets in in an incredibly short time. Here, as

always, food must not be resumed too early nor withheld too long.

As to the taking of remedies recommended by manufacturers and others as a cure or preventative for seasickness, the regular medical man has no alternative but to condemn the practice in general. When the ingredients are unknown to the physician he cannot logically commend the preparation. Many remedies of this latter class contain cocain, morphin, and other drugs which are distinctly objectionable. As the remedy suggested in these pages is quite sufficient for the needs of the traveller (if the rules in regard to diet, rest, etc., are strictly adhered to) recourse to objectionable nostrums so freely advertised is quite unnecessary and must be condemned as being uncertain and in many cases positively harmful.

CHAPTER VII

HINTS ON DIET AND DIGESTION

It has frequently been pointed out that greater intelligence is displayed by the farmer in feeding his hogs and cattle than by human beings in the selection of their own food. The farmer, under the advice of scientific experts, selects for his animal the most economical and wholesome foods due regard being given to food-value, digestibility, etc., whereas man is still to a great extent guided by routine and vicious habit in the selection of his food and in the amount he eats. Beyond a certain sense of gratification and well-being experienced after partaking of certain foods, the vast majority of people know little or nothing concerning the nature of the food they eat; or whether they eat too much or too little food as a whole; or too much or too little of any given kind of food considering the special needs of the body in each particular instance. In fact, most people in the preindigestion stage of their existence, do not seem to regard the stomach seriously, but look upon it as a sort of play toy placed in the body for the sole purpose of endlessly catering to the pleasures of its owner. The average man is sadly lacking in versatility when it comes to improvising rational means of self-amusement as an escape from boredom. When not actually engaged to some interesting or useful purpose, the best he can do is to fall back upon eating and drinking or smoking and the like.

Women, too, who should be our natural guides in such matters, may be seen at the theatre stuffing themselves

with chocolates and bonbons, even though they have just dined heartily, and the accumulation of useless fat about their chests and chins is already so great that it is only between breaths that they get an occasional glimpse of what is going on upon the stage. The incessant rhythmic swing of jaws in the orchestra stalls, during the tense still moments of the drama, distracts the observer and turns his thoughts to other kinds of stalls where the work of fattening the body to some purpose is in full progress. But further comparison would be unjust. Even in Shakespeare's own land, where they pride themselves, and justly so, on their fine productions of the premier poet's works, one is pestered between the acts with the rattle of cups and saucers. Think of it! Between the acts of a well-acted Shakespearian play we need a cup of tea to wake our slumbering brain-cells! Between the acts when our minds should be given up to retrospect and reverie, and the full enjoyment of ecstasies evoked by beauty of thought and expression, and by grace of gesture and movement. Why do we go to the theatre if it bores us and we are compelled, after one short act, to have recourse to our overworked stomachs to dispel our *ennui*?

It is a fact that most people, at some time or other in their lives, use the stomach as if it were a garbage receptacle or ash-can into which they toss all kinds of odds and ends at all times in all manner of places and conditions. But even an ash-can has its limits of endurance and when the inevitable indigestion comes, the last thing to be thought of as a cause is the previous abuse and maltreatment to which the stomach had been subjected.

Numerous illustrations might be given of how little is known by people in general of the nature and proper uses of the commonest foodstuffs. It is a common mistake to confound indigestion with constipation. Even those who have learned to differentiate between these two totally dif-

ferent conditions fail to turn their knowledge to practical account. Thus persons suffering from acute gastric or intestinal disorder eat brown bread or vegetables, such as spinach, etc., which are supposed to be good for the bowels. They forget that it is chiefly because of their *indigestibility* that such articles are of any benefit in counteracting constipation. When milk is mentioned to the woman suffering from overeating she objects to it on the ground that it causes "biliousness"; and it is only after some argument that she can be got to listen until it is explained to her that if milk be taken with, or one or two hours after, a heavy meal, it will cause indigestion and discomfort; for a good drink of milk is a fairly heavy meal in itself, one pint of it being equal in food value to five or six eggs or about half a pound of beefsteak. On the other hand, if milk be used to replace the meat and eggs of a heavy meal, not only will it not cause "biliousness," but it will be a grateful change for the stomach and will aid in maintaining or restoring the normal functions of digestion.

Women also object to milk on the ground that it "fattens." Of course it fattens if it is taken *in addition* to the usual number of meals; but if it be used to replace, say, the midday meal, it will not only not fatten, but it will completely satisfy the "midday hunger," which is, to a great extent, of wholly unnatural and artificial origin, being mainly the result of bad habits of eating.

Generally speaking, absence of appetite is an indication that the body does not need food. And yet how many patients suffering from overalimentation and obesity ask the doctor for something to give them an appetite. Young women, too, who are in mortal dread of taking on flesh and losing their graceful lines, as so many women unnecessarily do at a comparatively early age, indulge in their preprandial cocktails without knowing or caring what

must be the outcome of creating an artificial appetite which necessitates the taking of an abnormal amount of food. The whole practice of taking alcoholic liquors and bitter tonics before eating is as fallacious and stupid as the eating of a heavy meal regardless of the physiological needs of the body, simply because the hands of the clock point to a certain hour.

In explanation of the origin of what may be called "*the midday habit-hunger*," it may be said that if a person eats, let us say a heavy breakfast consisting of cereals, meat, and other things, it will take at least six hours before the stomach can get rid of all the meat and cereal. With many it may take considerably longer, especially if they are of the nervous type, or have poor digestion, or are engaged at work that keeps them all the time tense or "on the jump," and above all if the meat be not chewed most thoroughly. This being the case the midday meal is added to what is left over in the stomach from the morning meal, and there is no let up in the process of digestion, so that the stomach muscles and glands have no chance to rest and recuperate. With the addition of the second meal the handicapped stomach bravely essays its unnatural task, but just as it seems in a fair way of accomplishing it, a third heavy meal is thrown in on top of the remains of the other two. Again the stomach tries and for a time it may succeed in doing its work without manifesting signs of distress. Sooner or later, however, stomach insufficiency supervenes and the first symptom of it will usually be loss of appetite for breakfast, or even nausea brought about by the fatigue of the stomach muscles and glands which have had to *work all night* in endeavoring to dispose of the previous day's work; for, in sedentary persons eating three heavy meals a day, food from the previous evening's meal *frequently lingers in the stomach all night* and even much longer at times.

By destroying the desire for breakfast nature attempts to compensate for the injudicious overeating entailed by three heavy meals a day. In this way the individual is restricted, against his will, to two heavy meals. But as these are close to each other, viz., lunch and dinner, the stomach enjoys no rest between them, and the recently established compensation suffices only for a short time. Chronic indigestion ensues and the victim experiments with his diet, eliminating one article after another, until he is reduced to the merest pickings; and even these may "squeeze and distress" him, as every dyspeptic knows. And now how differently the individual regards his stomach. What a change from the ash-can to the canary picking stage! And what a howl and cry is made because "one can't sit in to table and eat like other people!" "What did *I* ever do to merit such punishment?" the victim asks, when it is plain to every one else that it is nothing more than the old story of cause and effect which people scoff at when well and consider as farfetched, cold-blooded, and unsympathetic when they are ill.

But how about the "midday habit-hunger?" It has recently been shown that hunger-pangs are the result of mild contractions of the muscles of the stomach, and that both hunger and appetite are, to a great extent, subject to habit formation. When a man is accustomed to a daily meat-lunch, elaborate preparations for the meal are made within the body about the noon hour; in fact, the individual's whole being is in a state of subconscious expectancy as the result of his daily habit of eating at this hour, and impulses are sent out automatically from the brain to the mechanisms immediately controlling the various muscles and glands involved in the process of digestion. And if the expected meal be not forthcoming at the proper time, the individual will more than likely be cranky and irritable, or suffer from headache or other nervous disturb-

ances. From this it would seem that the midday hunger is in reality the result of our habit of eating heavily at midday, and is not therefore a true indication that the body needs the food for which the digestive organs are clamouring. A further proof of this is the fact that if heavy eating at midday be suspended, the "midday habit-hunger" will soon disappear and a light lunch will satisfy the individual and make him happy the whole afternoon, brimful of expectancy for the evening meal.

A suggestion may here be offered to employers of clerical and other help in large cities. It would pay such employers to supply each of their employees at the lunch hour with one pint of the best fresh milk. This alone or with bread and butter added, makes an ideal lunch and renders the employee who takes it twice as efficient for the afternoon as the one who eats a heavier and more expensive meat lunch. This is no mere theory but plain hard fact, which any one who chooses may verify to his own satisfaction. It is not so much in the interest of the employer that this suggestion is made as in the interest of the employee; for such a lunch is far more nutritious and digestible than the "something or other with cake and pie" taken daily by the average employee in large cities; and it prepares the way, moreover, for the enjoyment of the evening meal (which, by the way, should be the heavy meal of the day), adding thereby greatly to the happiness of the home-coming hour.

With such a lunch the employee will work harder during the afternoon, thus keeping himself square with his conscience, for the idler and shirker are never really happy. Moreover, it is a blessing in the household to have a man come home to dinner fit and ready, like a properly trained athlete coming to the mark. No woman of normal instincts could fail to appreciate the advantages of such a situation.

A man whose body and mind are at repose after an honest day's work, and whose digestive apparatus is rested and ready for a meal, or perhaps slightly clamouring for it under the stimulus of natural hunger, is not likely to be hypercritical about the cooking and other things when he comes home to dinner. On the other hand, the man who tries to work at top speed during the afternoon after a heavy luncheon will find that the quality of his work is not up to par; and, what is still worse, he goes home to dinner with his half-digested lunch still hampering his tired stomach. No wonder he is cranky and irritable! And just think of the task his wife has in trying to cater to the palate of a man with absolutely no trace of appetite. Nothing can please him. Cocktails and other forms of alcoholic drinks and tonics are resorted to, but these are temporary makeshifts which may easily prove disastrous alike to digestion and domestic felicity; for persons who do not relish their food may easily acquire the drink habit. It is in this way that poor cooking has been charged with driving men to drink. Too often, alas, the unfortunate cook is held responsible for what is nothing more than the natural consequences of our own ignorance and faulty habits of eating.

Whilst we are on this subject it is not out of place to point out other advantages of the light lunch system, especially in those families in which the members come home to lunch. With all our love and respect for the presiding guardian of our hearths and homes we are very thoughtless and exacting when we insist on an elaborate hot lunch that not only does us no good, but positively injures us and spoils us for the rest of the day. In many families, the work of getting the children off to school is scarcely over with, when the mother has to set herself to the task of preparing an elaborate lunch. What opportunity has an unfortunate woman so situated to get her

shopping done, not to mention the time necessary for exercise in the open air, rest, study, self-improvement, etc. The present unnecessary system of eating heavy, irrational lunches in the home is a severe handicap to the ambitious mother. With a lunch of milk, or of milk and bread, or of some other such simple material, the mother could have the best part of the day for herself and her plans. And to what advantage the young mother could utilize this precious time which, under present conditions, she has to give to unnecessary drudgery, chained to the kitchen range.

As habits of appetite and hunger are capable of growth and cultivation, it is a necessary part of our education to see that in this respect, as in all others, our habits are good and that they tend to promote our mental and physical efficiency and well-being.

The author's experiments on the semicircular canals and his experimental studies in seasickness emphasize the intimate relationship between the central nervous system (brain, etc.) and the processes of digestion. There is reason for believing that the vast majority of stomach disorders, even including organic and inflammatory conditions such as cancer, ulcer, gastritis, etc., have their remote origin (predisposing causes) in nervous disorders. It is accepted now that ulcer of the stomach, when undiscovered or untreated, has a marked tendency to degenerate into cancer. Hence the most important measure at present known to the profession for the prevention of *cancer* of the stomach is the prompt treatment of *ulcer* of the stomach and allied disorders. But ulcer of the stomach has itself various predisposing causes, ranging from mild forms of indigestion to marked chronic and subacute inflammation of the stomach lining (gastritis). Hence, ultimately, the preventive treatment of cancer and ulcer of the stomach includes measures calculated to cure or prevent the predisposing causes of these maladies. The obvious

lesson is that no case of disturbed gastric function should be passed over as being merely indigestion or dyspepsia. Gastric ulcer, and even gastric cancer, may not for a long time cause disturbance, except what would be, and too often is, readily passed over as "a little indigestion." In most cases, however, disturbances of gastric digestion of recent origin merely indicate that the sufferer needs readjustment of his diet to suit his age, mode of life, the capacity of his organs, etc. Such readjustment most frequently means simply the partial elimination of one or other of the great classes of foodstuffs, usually the proteins represented in ordinary diet chiefly by meat, eggs, fish, cheese, and such like articles. Reduction in the amount of the offending article or articles is followed in most instances by prompt relief. And herein lies the secret of the success of "food scientists," vegetarians and other diet faddists who take bountiful fees *in advance* for telling people in an indirect way (i.e., by prescribing fruit, vegetables, and cereals) that they are eating too much and that their supply of certain foodstuffs must be limited. This, however, is not the chief objection to these "specialists"; for, being indicated, food restriction is usually followed by improvement, whether the restriction be practised directly under the advice of a physician or enforced in a roundabout way by a vegetarian diet. The point is that these "practitioners" ignore the modern scientific methods of diagnosis whereby the actual state of the organ may be ascertained, viz., whether there be actual disease of the stomach walls, gastritis, ulcer, etc. The effect of stuffing the diseased stomach with indigestible vegetable fibre and all sorts of coarse foods containing seeds, acids, etc., not to mention the failure to make an early diagnosis, whereby successful medical or surgical procedures might be undertaken, needs only to be mentioned to be appreciated.

In the treatment of digestive disturbances arising from any cause, the following hints will be of service: The nervous system should be relieved from strain as much as possible. Hence, rest, recreation, mode of life, change of scene, etc., have to be considered, and, above all, freedom from worry, whether the cause of the latter be actual or imaginary.

Of the three great classes of foodstuffs, viz., the *carbohydrates* (starch foods, including sugars and sweets), the *proteins* (meat, eggs, cheese, fish, etc.), and the *fats*, the carbohydrates are, under ordinary conditions, and in the absence of excessive gastric acidity, the easiest of digestion and are the first to disappear from the stomach. In this connection it is well to note that bread contains practically no gastric stimulants or secretagogues (i.e., substances which tend to promote the production of gastric juice and especially of hydrochloric acid) which would have a tendency to limit its own digestion in the stomach. Butter and fat, in general, tend to retard the production of gastric juice. Hence the combination of bread and butter in ordinary conditions of health is a good one, since the butter tends to prolong the action of the starch-digesting ferments or enzymes in the stomach. Some protein foods, such as meat and its extracts, contain an abundance of gastric stimulants (secretagogues), whilst others, such as eggs and milk, contain none of these substances and, in addition, these articles of food contain much fat. But as all protein food has the power of combining with free hydrochloric acid, thereby neutralizing the effect of the latter upon starch digestion, the ingestion of meat simultaneously with starch food does not affect the digestion of the latter as early as might be expected. However, it can be readily seen that where the object is to favour the gastric digestion of starch food, eggs or milk, together with butter, is the ideal combination. Such a meal, if the amount

of protein and fat be judiciously regulated, is highly nourishing, makes little demand upon the secretory function of the stomach, and by its comparatively rapid digestion and removal, it *secures a considerable period of rest between meals* for the stomach-glands and muscles. As starch digestion proceeds, sugars are formed which act as gastric stimulants (secretogogues). The digestion of starches, therefore, prepares the way for the digestion of proteins. The combination of raw eggs and milk, so often given to invalids, is a bad one for the average case. Neither of these foods contains gastric stimulants (secretogogues), and no good purpose is served by such a combination unless carbohydrate food be given at the same time.

The proteins are much more complex in their chemical composition, and therefore more difficult of digestion than the carbohydrates. Consequently they entail a much greater strain upon the gastric mechanisms. Moreover, protein passes into the intestine much slower than carbohydrate food, the passage through the pylorus being regulated by local, reflex mechanisms. One thing that too much stress cannot be laid upon is the fact that lumps of protein food, e.g., lumps of meat, resist the disintegrating processes of digestion and markedly prolong the stay of food in the stomach. Even when digestion has well progressed, lumps of meat, etc., when they reach the pylorus cause spasmodic closure of the latter, and instead of passing into the intestine they are thrown back into the stomach to await the further reducing action of the gastric juice. The net result is prolonged retention of protein in the stomach when the latter should be empty, its muscles and glands resting, getting ready for the work of the next meal. Similarly, in subacute and chronic inflammations of the stomach, such substances as orange seeds, spinach, tomatoes, particles of potato, oatmeal grains, and various kinds of fruits and vegetables have been removed from the

stomach a long time after ingestion, i.e., from nine hours to two or three weeks. This shows the absolute necessity of eating slowly and of thoroughly masticating all food, more especially if we persist in the irrational practice of eating three heavy meals within the short space of the working day. It may be true that the dog's stomach is capable of partially digesting pieces of bone and tough hide, but the lower portion of the dog's intestinal tube, viz., the colon or lower bowel, is short and straight so that the undigested residue of his meat diet is not retained for any length of time, as happens in the case of man whose colon being sacculated retains undigested materials for a comparatively long time, thereby affording excellent opportunity for putrefaction and so-called intestinal auto-intoxication. Moreover, it is a fact that birds, reptiles and related creatures, e.g., the ostrich, cassowary, snake, etc., have part of the stomach equipped with powerful muscles and the lining membrane of horny consistency for the purpose of grinding and crushing the food which these animals swallow without chewing. Such mechanisms may fairly be regarded as substitutes for teeth. Man, however, is not equipped with any such powerful apparatus; and, although he may bolt his food with immunity for a time, he will sooner or later learn to his cost that his stomach has no teeth.

Herbivorous and insectivorous animals, whose natural food is very indigestible, are equipped with long lower bowels (cæcal pouches), so constructed as to retain the undigested food for a considerable time, and in some instances (e.g., in some of the marsupials) the bowel (cæcal pouch) is so muscular that it can grind and macerate the food residue, so that further digestion is possible and the very greatest amount of nutriment can be extracted and absorbed. It seems, therefore, that the practice of eating indigestible vegetables in large quantity for

the relief of constipation is not well grounded. And, indeed, it is a fact that large quantities of vegetables do not of themselves seem to have any marked effect in overcoming constipation but often seem rather to aggravate it. The best general diet, therefore, is the evenly balanced mixed diet with a moderate amount of vegetables. One thing, however, must be mentioned. Physicians have so persistently insisted on a daily evacuation of the bowels that many nervous individuals become needlessly worried if the daily movement does not occur. Cathartics are immediately resorted to and these always tend to protract rather than to cure constipation. Regular evacuation of the bowels is a desirable thing, but it should be distinctly understood that many perfectly healthy persons have movements from the bowels only every second or third day.

The fats have already been discussed somewhat. Fats are set down by physicians and writers as irritating foods. It is only when they are taken in great excess, or when they are prepared by frying, whereby they are decomposed into fatty acids and glycerin, that ordinary fats, known chemically by the name of neutral fats, become irritating to the stomach. Some fats, e.g., those of high melting point are more difficult of digestion than others. Butter and olive-oil, which are "low fats," i.e., of a low melting point, are the blandest and most digestible of the fats. Fat is not digested to any extent in the stomach. If, however, the stomach motility or onward propulsion of food is poor, and the acidity low, much fat-splitting (40 to 50 per cent.) is effected, mainly by bacteria, in the stomach. Hence, whatever tends to retard the passage of fat into the intestine should be avoided. And since fat floats upon watery liquids, the ingestion of large quantities of water at meal-time, and especially the repeated ingestion of water just after, and between meals, should be

avoided, as it is quite possible in this way to favour the action of the fat-splitting bacteria by diminishing the acidity; and to prolong indefinitely the stay of fat in the stomach by keeping it constantly afloat, so that it cannot reach the stomach outlet (pylorus). The chief work of the digestion of fat is carried on in the small intestine by the combined action of the pancreatic juice and the bile. Hence, the habitual practice of taking daily saline cathartics (Rochelle salts, Epsom salts, etc., or preparations containing these salts) which, as we have seen, may impair the secretion of bile by the liver, seriously interferes with the digestion of fat which in turn may result in impaired nutrition of the nervous system, causing nervous prostration (neurasthenia) and other forms of nervous disturbance.

When bile is excluded from the intestinal tract (e.g., by tying off the bile-ducts), 40 per cent. of the fat taken in as food is found in the fæces or stools. Under normal conditions the fat-loss in this way should never exceed 15 per cent., and it may be as low as 3 to 5 per cent. In diarrhea the fat-loss in the stools is greatly increased. If fat, taken in as food, escapes through the gastro-intestinal tract in less than from twenty-four to thirty-six hours, the fat-loss in the stools is greatly increased. Thus, where fat passed out in from eight to twenty hours, the fat-loss was found to be from 20 to 40 per cent. These facts show how dangerous to the health and vigour of the organism as a whole is the routine practice of taking quickly acting cathartics such as the saline cathartics above mentioned which impair bile production and hurry the fats out of the intestine before they have proper time for digestion and absorption. Cathartics should therefore be avoided, and where recourse must be had to them only slowly acting cathartics should be used, and such as tend to beget movements closely resembling the natural movements.

Cascara sagrada may be regarded as a type of the least harmful of the laxative medicines which may be used.

Though each of the three classes of foodstuffs, viz., the carbohydrates, fats, and proteins is more or less digested in the stomach, all are powerfully acted upon by the digestive juices in the small intestine. Of the three the fats are two and one-seventh times as nutritious as either the carbohydrates or the proteins. The carbohydrates and the proteins contain about an equal degree of nutriment, or *caloric value*, as it is called. Hence, a quarter of a pound of butter is roughly the equivalent of half a pound of beefsteak, or of five or six eggs, or of one pint of milk, although taken by itself as a food the pint of milk is far more serviceable than any one of the others eaten alone, since it contains a well-balanced mixture of all the foodstuffs including the all-important mineral salts. But one must always be certain that the milk is fresh and pure. This means that it must have come from a reliable source in the first instance, and that it has been kept constantly at a temperature below 50° F., as above this temperature germs multiply in it at an enormous rate. Vegetables contain a large amount of water and indigestible fibre. Hence their food value is comparatively low, and if the diet be restricted to them large quantities have to be consumed in order to sustain properly the balance of nutrition. Fruits also are, to a great extent, made up of indigestible fibre and water. They contain, however, salts that are valuable to the economy. The custom of eating fruit *before* a meal is not as wholesome as people seem to think. The acids of the fruits are certainly injurious to the stomach with an inflamed lining, and the presence of acid at the commencement of a meal tends to check the digestion of carbohydrate or starch food.

The food should always be adapted to the needs of the body and to the capacity of the organs of digestion and

elimination. Thus the active athlete, or hard physical labourer, requires a *régime* different from that of the man who scarcely uses his muscles at all. Similarly the needs of persons in the decline of life are quite different from those of growing children and young people generally. Hence, in a vegetarian or other extreme form of diet the proper amount of the various foodstuffs may not be supplied to the growing youth, or to the active muscle-worker, whereas too much meat in the diet of old or sedentary individuals will upset the digestion which is the least harmful of the consequences since, if this does not happen, more food may enter the circulation than can be disposed of by the tissues in the normal manner and serious disorders of assimilation and disassimilation (metabolism) will ensue.

It should be remembered that in the processes of combustion incidental to muscular activity, the carbohydrate material, in the form of glycogen or liver starch stored up in the muscles, liver, and other organs is the first to be consumed; and here it may be remarked that the resting muscle contains a considerable amount of available glycogen, although in the matter of storing glycogen the heart has a greater capacity than any other muscle in the body. Fats, as such, are not stored in muscle and have to be converted, probably by enzymes, to glycogen before being available as an immediate source of manifest energy (heat or motion). When all the available glycogen has been consumed, then the fats are drawn upon; and ultimately, when these latter have been exhausted, the substance of the muscles and of the other tissues is called upon. Under ordinary conditions it is believed that protein food as such supplies directly little, if any, of the energy for the gross bodily activities. In the digestive processes, however, it has been shown that substances of the fatty acid type are derived from the proteins as well as from the fats

and carbohydrates. Thus, protein food is split up within the body into a nitrogenous and a non-nitrogenous substance. The nitrogenous substance is cast out at the earliest opportunity, as urea, etc., in the urine and sweat, whilst the non-nitrogenous substance, which closely resembles the products of digestion of the carbohydrates and fats, i.e., fatty acid bodies, follows the laws governing the disposal of such foodstuffs. Hence the proteins *do*, to some extent, supply the energy for the bodily activities (fuel food), but it is not from protein (nitrogenous) material as such that this energy is derived but from a carbohydrate-like product of protein digestion; and this function of protein food may be safely substituted by fats and carbohydrates, especially in a person living on a mixed diet. On the other hand, it has been proven, over and over again, that no matter how much protein food may be taken into the body there is, in the adult, no *storing of nitrogenous material* for future use such as occurs in the case of the carbohydrates and fats. Moreover, an excess of protein (nitrogenous) food markedly accelerates the combustion (metabolism) of nitrogenous food and of the fats and carbohydrates as well. Hence, a diet rich in protein food tends to reduce obesity; and if meals containing meat, etc., be given at frequent intervals, the digestion will become impaired so that this also helps in the reduction of superfluous flesh. Such methods, however, are not without risks of surplus food-poisoning and disorders of the economy which may easily prove more troublesome than the obesity. It is therefore quite possible for a person to become thin from eating too much and too often, whereas, on the other hand, persons frequently put on good sound flesh upon what seems to them to be a very restricted but altogether rational diet.

It might be thought that a person taking active exercise would retain some of the nitrogenous substance of the

food as a reserve supply. It has been proved, however, that such is not the case. Nitrogenous food is never stored to any extent in the body, its only function being the replacement of the actual wear and tear of the tissues. But is not the wear and tear of the tissues much greater in the active than in the sedentary person? The answer is that there is practically no difference in the case of *average adult persons*, although there is a far greater combustion of carbohydrate and fatty material in the case of the active person. It has been found that nitrogenous material is retained to a greater extent in the bodies of growing children and of convalescents from wasting diseases, starvation, etc., than in those of adults. Perhaps athletes also, starting out on a course of training to build up their comparatively atrophied muscles retain more nitrogenous material than an ordinary, fairly active adult. These are the only instances in which an excess of nitrogenous substance, over and above the very small amount needed for the daily waste of tissue from wear and tear, is retained within the body. But even in these instances a very slight increase in the daily amount of protein food meets the requirements. Hence, growing children and convalescents, and perhaps athletes in training, require more protein food than the ordinary adult, although the amount needed by them is not greatly in excess of the amount required by the average full-grown individual engaged in the ordinary activities of life.

If, therefore, large amounts of protein food are of no use to us it seems irrational to subject our bodies to the great strain involved in their digestion and excretion, not to mention the possibility of surplus food-poisoning and disorders of metabolism which tend to incapacitate the individual and shorten life. The habitual consumption of protein food in excess of the physiological needs of the body is a potent factor in using up such vital organs as

the liver, kidneys, etc., and in hastening the processes which result in premature aging and death.

The lesson is that the protein food of our diet may be greatly reduced with advantage to the human economy. It has, moreover, been actually demonstrated on human subjects that when sufficient amounts of carbohydrates and fatty food were taken a marked reduction in the intake of protein food greatly benefited the health and increased the individual's endurance and capacity for work.

The proteins, therefore, as such may be considered as supplying the material for the repair of tissue-waste (tissue food), whilst the carbohydrates and fats supply the energy for muscular action (motion) and the production of heat (fuel food). When more carbohydrate and fatty food is taken than is required by the daily activities, the surplus is stored as fat in the various regions of the body and especially under the skin about the abdomen. On the other hand an excess of nitrogenous food (meat) beyond the amount required for the building and repair of the muscles, etc., tends to poison the individual by putrefaction in the large intestine, or by faulty assimilation (metabolism), excretion, etc. When an excessive amount of starch food is taken, part of it may undergo fermentation, but the products of such fermentation are of themselves quite harmless. However, excessive amounts of starchy food markedly facilitate protein putrefaction and in this way an excess of carbohydrate food may be distinctly injurious, especially in cases of chronic diarrhea and allied conditions.

It must be remembered that almost every article of daily food contains in greater or less quantity each of the three classes of foodstuffs, viz., fats, carbohydrates, and proteins. Thus bread, although rich in carbohydrate food, is not a pure carbohydrate food to the exclusion of protein; and meat, though rich in protein, contains carbohydrate (glycogen) fat, etc.

The fundamental rules for treating disturbances of digestion may be summarized thus:

1. Absolute abstinence from all food for a short period during an acute paroxysm, i.e., when the stomach rejects everything that is offered to it.

2. Gradual but early resumption of ordinary food.

3. Selection and rational restriction of food. The food selected should be nutritive and such that it will impose the least burden on the gastric, secretory, and muscular apparatus. In inflammatory conditions of the stomach, ulcer, etc., coarse vegetables as well as raw fruits, fruit juices, etc., are to be avoided. Even in health raw fruit and fruit juices should not be put into an empty stomach. The custom of eating fruit, especially such as grape fruit, etc., *before* breakfast is a bad one. Indeed fruit, at all events raw fruit, might well be excluded from the diet of any one suffering from stomach disorders. Cooked fruit is less objectionable, but even this should be taken with care.

4. Thorough mastication of all foods.

5. Regular times for eating should be carefully arranged in accordance with the kind of food taken at each meal, so that proper rest is secured between meals for the secretory and muscular mechanisms of the stomach. Some foods, such as meat, vegetables, raw fruits, etc., remain many hours in the stomach, whereas other foods, e.g., toast, bread, etc., remain but a short time. Hence the necessity of regulating the time for eating by the nature of the food taken, so that there will not be an overlapping of meals in the stomach on the one hand, nor too long a period of "stomach emptiness" or starvation on the other. Generally speaking the interval between meals should be at least five or six hours. Heavy luncheons should be avoided. No two consecutive meals should contain meat or a large amount of food rich in protein. Nothing should

be eaten between meals. Above all, milk should never be taken between meals, as at this time the highly acid gastric contents will cause an unnatural, thick, indigestible curd instead of the delicate, soft, flocculent curd that occurs in the normal digestion of milk. The result is indigestion or "biliousness."

6. The character and quantity of the food must be governed by the mode of life of the individual which in turn must be governed by the digestive capacity. Thus if a man works hard he must in turn be suitably fed, or the nervous system and the whole economy will suffer. If, on account of disease or other cause, the stomach be not in a condition to digest the food necessary to meet the requirements of the body in active work, then it is rational to change the mode of life temporarily so as to lessen the work of the stomach by lessening the amount of food required by the body in general. Hence the necessity of rest and freedom from worry in the treatment of stomach disorders.

The best diet for those engaged in intellectual pursuits is a more or less concentrated one consisting of a fairly large amount of animal food with moderate amounts of fats and carbohydrates. Bulky, indigestible vegetables should be taken only in moderation.

Owing to certain limitations in our present knowledge regarding the intermediary metabolism of foodstuffs, it is much safer for mankind to continue using a fairly liberal mixed diet. The part played by the inorganic salts, e.g., sodium chloride or common salt and various other salts that come to us in our food, is not yet fully understood. It has been shown, for instance, that rats fed upon the protein substance present in Indian corn did not grow and reproduce like normal rats, but when the salts of milk were added to the food the animals at once took on growth and behaved in every way like normal rats. Here the

lesson is that we should be careful about the so-called strictly vegetarian diet and the vegetable proteins so much lauded by the vegetarian faddist. In the present state of our knowledge a liberal mixed diet, in which there is a moderate amount of protein food, and a sufficiency of carbohydrate and fatty food to supply fuel for the activities of the individual, is to be preferred. In addition there should, of course, be a fair amount of fruit and vegetables which, in the case of persons suffering from indigestion, etc., should always be well cooked and taken with the evening meal.

7. Water is absolutely necessary for the body and for the digestive processes in particular, but the manner and time of taking it has much to do in determining whether, in a given case, it may help or hinder digestion. The advice is too frequently given to drink water *not at but between meals*. Such advice is as worthless as telling a neurasthenic to take cold baths without giving definite instructions regarding such necessary details as temperature, duration, etc., which make the bath a safe and useful procedure. If water be taken after meals anywhere from one to two hours, it may, in most cases of disturbed gastric function, be injurious. Where the acidity is low and the secretory functions impaired, the ingestion of water at the times indicated checks the digestive processes, diluting the gastric juice and carrying the free acid into the intestine, for water is not absorbed to any extent from the stomach. Moreover, if there be much fat in a meal, taking water between meals causes it to rise to the surface of the stomach contents and keeps it there until the physical conditions within the stomach permit its approach to the stomach outlet (pylorus). As before stated it is possible in this way to indefinitely prolong the stay of fats in the stomach. The best time to take water is from thirty to forty minutes before meals. After meals water should

not be taken, if possible, until within half an hour before the next succeeding meal. As a general rule one pint of water half an hour before each meal will meet the requirements of the average individual. If the weather be warm and thirst is felt, slightly acidulated water may be taken two or three hours after eating a meal containing fat and protein. Weak lemonade, slightly sweetened, answers the purpose very well. Such a drink will not alter the stomach acidity unduly and the sugar acts as a gastric stimulant (secretagogue). In some cases of indigestion, viz., those in which there is an excess of acid in the stomach, acid drinks of every kind should be avoided. In all such cases the patient himself will quickly find out whether the acidulated drink agrees with him or not. If it does not agree, then mild alkaline drinks should be taken. A solution of bicarbonate of soda, say half to one teaspoonful to a pint of warm water, is an excellent drink under these conditions. Carbonated waters, e.g., vichy, seltzer, soda-water, and charged waters generally, tend to promote peristalsis or active movements of the stomach and intestine, but they also favour the growth of anaerobic bacteria which are exceedingly noxious germs in gastrointestinal disorders. The amount of water that should be taken in the course of the day is subject to limitations, just as in the case of food. The advice is often given to "drink all the water you can so as to flush out the kidneys." But water beyond a certain amount will keep the kidneys overworked to no good purpose, since it does not further the elimination of waste products, whilst if too little water be taken the urine will become concentrated and tend to irritate the kidneys. On the whole the average person will find that the rules above laid down for the taking of water will suffice in ordinary conditions. It should be remembered that cold water by stimulating the stomach muscles may develop or aggravate the sense of hunger,

whilst warm water tends to relax the stomach and thereby to allay hunger-pangs. Hence, in persons suffering from excessive eating, or from overworked digestive organs, warm water should be taken before meals in preference to cold water. It is a curious fact that in prolonged fasting, whether this be done voluntarily or through necessity, the sense of hunger disappears after three or four days and the fasting individual feels fairly comfortable if he be allowed a fair supply of water.

8. Alcoholic drinks in moderate quantity, that is, when the alcohol in the stomach ranges from 3 to 10 per cent. of the gastric contents, help digestion, but they do so only for a short time. When the amount of alcohol in the stomach is greater than 10 per cent. digestion is retarded. Alcohol, even in small amounts will, however, in the long run, prove decidedly injurious in digestive disorders, as alcohol is itself one of the most potent causes of acute and chronic inflammatory conditions of the gastric mucosa or lining membrane.

9. The bowels should be kept open. If drugs be found necessary for this purpose the least harmful should have the preference, such as some preparation of cascara sagrada. Saline cathartics and purgatives should, in general, be avoided.

10. All food should be properly cooked and served. Cooking increases the digestibility of vegetables by breaking up the indigestible cellulose envelope that encloses the starch grains. Thus moist heat bursts the cellulose in wheat and barley grains at 176° F. and in potatoes at 149° F. Cooking, however, coagulates protein food and renders it less digestible. Proteins coagulate at 155° to 175° F. in water; hence if eggs be kept in water at 160° to 165° F. for seven minutes the coagulation will be lighter than that which occurs at a higher temperature. Cooked in this way the digestibility of eggs will be least affected.

Dry heat partially digests starch by changing it to dextrin, e.g., baked potatoes, toast, crust of bread, etc. Although cooking partially digests many starch foods it is not therefore advisable to take, for instance, toast or sugar in any quantity as regular articles of diet. Owing to its partially digested condition toast is too readily converted to sugar in the stomach. The result is that the normal processes of digestion are more or less dispensed with and this has the same effect upon the digestive mechanisms that inactivity has on any other mechanism, viz., it leads to weakness and atrophy of the unused organs. Moreover, the system is much more tolerant of carbohydrate food, when it is taken in the insoluble form as starch, than when it is taken in the more soluble form of dextrin or sugar. Thus where excessive amounts of sugar are taken with the food, more sugar enters the blood than the liver can dispose of, and the excess of sugar in the blood is passed out in the urine. During the natural progress of the digestion of starch only small quantities of carbohydrate food reach the intestine at periodic intervals; but when excessive amounts of soluble carbohydrate are ingested there is a tendency to the premature production of hydrochloric acid in the stomach (secretagogue action of sugars) and an excess of carbohydrate escapes into the intestine where it supplies a favourable medium for the growth of noxious bacteria (fermentation). The objections urged against predigested carbohydrates, e.g., toast, sugars, etc., are valid against other forms of predigested foodstuffs as well as against the use of pepsin, dyspepsia tablets, bitter tonics, cocktails, appetisers, and such like, which are allowable only in exceptional cases and for limited periods. In any case of chronic dyspepsia, from whatever cause, an early return to plain, wholesome food is desirable. The most that can be expected from patent or proprietary predigested foods, is their stimulating (secretagogue) action. When

it comes to supplying the body with the energy necessary for the day's work, we must continue to patronize the grocer and the baker, and not rely upon something that comes from the pharmacist's in a neatly wrapped tin box. All this, however, does not mean that foods containing raw starch, e.g., potatoes, cereals, etc., should not be thoroughly cooked, for this is indeed a prerequisite for their proper digestion in the human alimentary canal. Even where cooking renders food less savory and digestible it may nevertheless be desirable so as to prevent the introduction of disease germs into the system. It is well-known that raw oysters and raw green vegetables (lettuce, etc.) may carry the germs of typhoid fever. Contaminated milk swarms with all sorts of germs. Milk, unless absolutely above suspicion, should always be boiled or pasteurized before being taken by a patient suffering from disease of the stomach or intestines.

As before stated, frying splits neutral fats into fatty acids and glycerin, both of which tend to irritate the inflamed or disordered stomach. All fried foods should therefore be avoided. Too much stress cannot be laid upon the necessity of cooking slowly, i.e., at the lowest temperature that will effect the desired object, since rapid cooking at high temperatures tends to impair the value and digestibility of food. Sometimes when one cannot change his cook, it is advisable to restrict oneself to those articles of diet which the cook knows how to prepare properly. Variety in diet is exaggerated as to its value. Too much variety may become a bad habit in itself. A fair admixture of the three classes of foodstuffs in wholesome form, and reasonably well prepared and served, will best meet the requirements of nature. Coaxing and coddling are superfluous.

11. Tea and coffee, and all such stimulating drinks, should be carefully avoided. Every mechanism in the

body becomes more or less fatigued, that is, loaded with poisons called fatigue substances, after the day's work. During sleep the whole organism and especially the nervous system, becomes rested and restored, ready to commence another day's work. It should be remembered that the nervous energy stored up during the night has to last all day. Hence the stupidity of whipping the nervous mechanisms with such stimulants as tea and coffee just after arising. A runner starting on a Marathon race knows very well that he must carefully regulate his pace throughout the race if he intends to run out the distance. A seasoned distance runner can continue running almost indefinitely, whereas the sprinter can bring himself to a state of utter exhaustion in a few hundred yards. Hence the distance runner studies every possible means of conserving his energy, whereas the sprinter endeavours to throw every ounce of his strength into his efforts in the hope of increasing his speed. The distance man is economical in his outlay of nervous energy whilst the sprinter is quite extravagant. In the routine of daily life most nervous individuals practise the extravagant method of the sprinter where the economical, conserving method of the distance man would equally meet the requirements. Thus the most ordinary acts are performed with rush and hurry, or with painful *overattention*, all of which involves excessive and unwarranted expenditure of nerve force out of all proportion to the needs of the case.

Such extravagance may be compared to the employment of a battery of twenty thousand dry cells to do what one or two cells could effectively accomplish, e.g., ring a single door-bell. And as the supply of nervous energy is by no means unlimited, especially in nervous or neurasthenic individuals, and in those suffering from digestive disturbances, conservation of nerve force must be practised at all times. This applies to worrying and thinking as well as

to physical acts. It is a fact that many individuals who suffer from indigestion and constipation get almost instant relief from their troubles when they give up their work and worry and leave the city. Thus city workers frequently forget their indigestion and nervousness, and eat all sorts of supposedly injurious articles with impunity, during the summer holidays, whether these consist of a two-weeks' stay at a farm-house, or an extended European tour. It is well known that tramps and vagabonds are seldom troubled with indigestion or constipation. It is therefore necessary to regulate the psychological activities of the individual so as to prevent overattention and the carrying over of worries incidental to work into the period allotted for rest and recreation. In addition, the day should not be begun by whipping the nervous system into unnatural activity by means of tea and coffee. The immediate results of such stimulation may be a sense of well-being, but this is merely temporary and soon gives place to reactionary fatigue and exhaustion. Tea and coffee are also injurious to the inflamed mucosa or gastric lining. In young women habitual tea-drinking frequently plays an active part in causing gastric ulcer. Moreover the active principle of tea and coffee is chemically identical with substances of the uric acid type. On this account these beverages should be avoided by persons suffering from rheumatic or gouty disorders. In all painful disorders tea and coffee should be avoided, as they increase our sensitiveness to pain, thereby adding unnecessarily to our suffering. The effects of tea and coffee in causing nervousness and wakefulness are too well-known to require more than mere mention. It does seem strange, however, to hear people asking for something to make them sleep when they are unwilling to give up taking tea or coffee just before retiring.

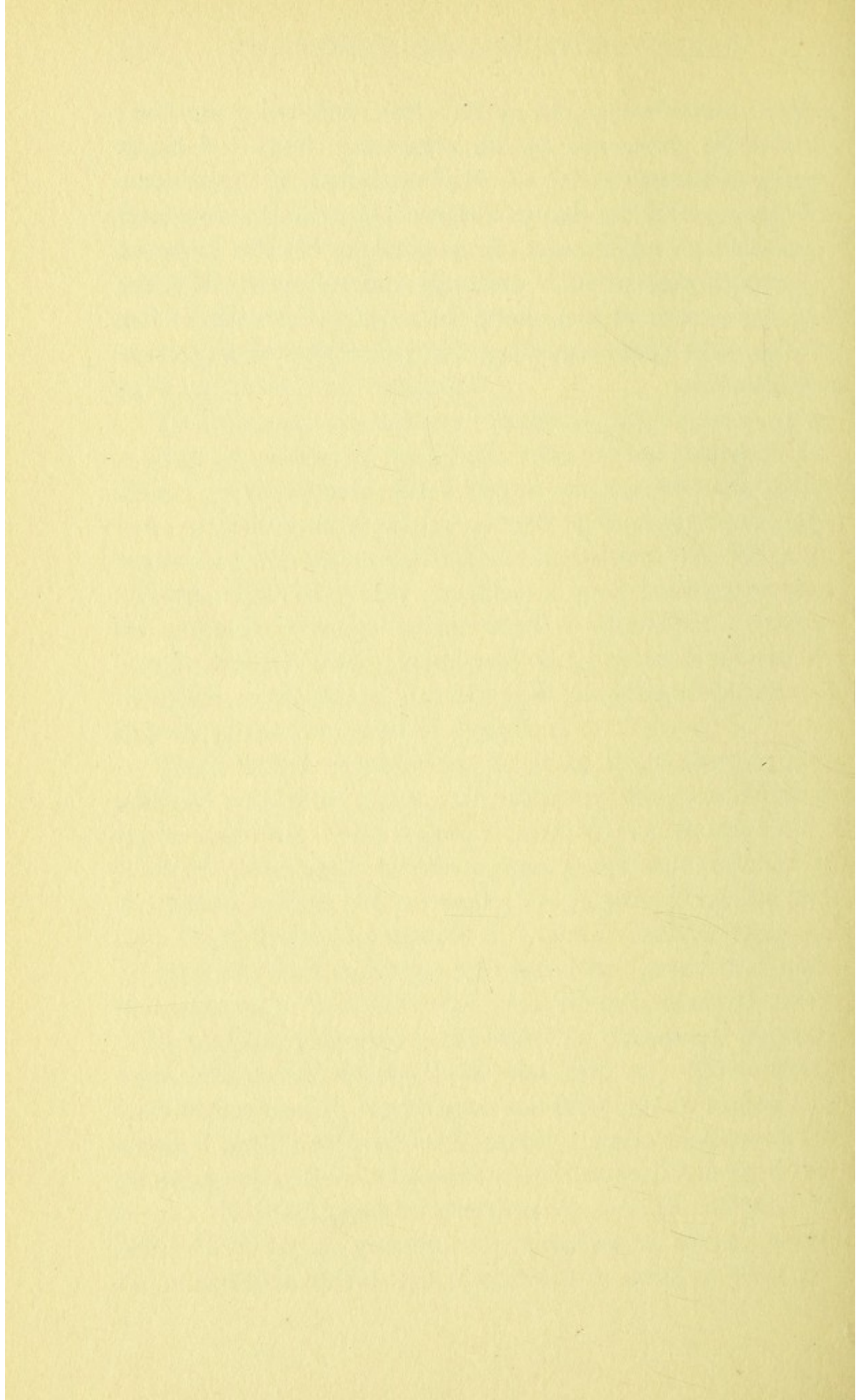
12. Finally our meals should, as far as possible, be

made happy events in the daily routine. Eating is one of the legitimate pleasures of life, and meals should be made feasts of joy instead of being merely treated as perfunctory ceremonies to be got through with as quickly as possible. There should be no hurry and the surroundings should be as agreeable as possible. No one should attempt to eat heavy articles of food when in an extreme state of worry or emotional excitement, or when in a state of exhaustion or extreme fatigue.

To have a certain degree of natural hunger before eating is a luxury unknown to people who eat too much or too often. As previously stated hunger-pangs have been shown to be of purely local origin, caused by a slight tonic contraction of the muscular walls of the stomach. When of natural origin they are therefore a good indication that the stomach is ready for the work of digestion. Indeed hunger and the sight, taste and odour of food, as well as thorough mastication, are all most important factors in initiating the processes of digestion.

These rather sketchy hints, it is to be hoped, may prove of service to many individuals in the great army of those suffering from nervous and digestive disorders. With the exercise of a little judgment and self-restriction, the results will prove an agreeable surprise to those who have tried drugs and nostrums, and the various irregular systems and fads in vain. Of course the discontented neurasthenic with his overworked, starved and poisoned nerve-cells, and his distorted perspective of things in general, must seek relief wherever he can find it. These hints were not penned to encourage home treatment for advanced cases of gastric or nervous disorder. Such cases need the personal supervision of a physician if not sanitarium treatment. Minor degrees of disturbance such as incipient or mild forms of indigestion, or neurasthenia, which permit the sufferers to continue at their work in spite of their ail-

ments, will, however, be greatly benefited and even cured by a strict adherence to the rules laid down. A fairly large percentage of such cases, if neglected, will get worse and worse until the graver states of gastric disorders and neurasthenia supervene. It is partly with the hope of helping to prevent such unhappy consequences that the author has seen fit to present, in popular form, these few fundamental facts regarding the principles of digestion and dietetics.



APPENDIX

THE REMUNERATION OF SHIP SURGEONS

(From the *Medical Times*, February, 1912)

That ship surgeons are notoriously underpaid is a fact well known to those who have had occasion to inform themselves on the subject. The steamship companies demand highly qualified medical men to minister to the needs of passengers and crew, but forget that "the labourer is worthy of his hire." Not only must a medical officer possess professional ability, but many lines expect him to be a social mentor as well; and all this for \$50 a month, expensive uniforms not included. While we entirely disapprove of any sentiment which would appear like an indorsement of a man in measuring the extent of his services to his employer by the amount of his compensation, we must admit that the person distinctly underpaid is extremely likely to easily slide over unpleasant duties. The ship surgeon, for instance, is scarcely apt to make as careful an examination of immigrants boarding his ship as one of the better paid marine surgeons of the port of entry. He doubtless will not consciously neglect his duty, but the work may seem less necessary to him.

On account of the small salary medical work at sea is unattractive to physicians, except to those young men just out of the hospital, who have a desire to see a little of the world before settling down to practice. This fact was brought out at the meeting of the Canadian Public Health Association in Montreal in December. Dr. J. D.

Pagé, of Quebec, read a paper on "Medical Inspection and Care of Immigrants on Shipboard," in which he emphasized the necessity for a more efficient examination by ship surgeons of immigrants to Canada. He said that while the duty of examining the newcomers devolved upon the medical officers of the ships, they frequently failed to live up to their obligations and that the two or three thousand people who arrive in Quebec from abroad each year have to be carefully examined by the medical inspectors of the port.

If this is true of Quebec it may also have a bearing on other and greater seaports. During the fiscal year ending June 30, 1911, 749,642 immigrants entered this country through the port of New York. Of these 16,910 were physical or mental defects, according to the Marine Hospital surgeons at Ellis Island, and 5,296 were deported. Among 209 found mentally defective were 10 epileptics, 11 idiots, 24 imbeciles, 70 insane and 94 feeble-minded. There were also 1,167 cases of trachoma, among 1,361 cases of contagious diseases reported.

It probably was not the fault of careless ship surgeons that this great body of undesirable persons were brought to this country, but it would seem that more careful inspection on the other side would have prevented many from being accepted as passengers. From a medical viewpoint this influx is fraught with danger to the public, as is evidenced by P. A. Surgeon H. M. Manning, U. S. P. H. and M. H. Service (*Med. Rec.*, September 30, 1911), who found in 412 unselected patients in the Immigration Hospital, Ellis Island, over 40 per cent. infected with intestinal parasites, and over 24 per cent. showed the presence of the hook worm. Enormous amounts of money are being spent in the United States to get rid of this parasite, while at our very gateway it is pouring into the country via the anatomies of immigrants.

Where can the blame be properly placed?

Dr. Pagé is of the opinion that while the main reason for this shirking of responsibility is that the surgeons are young men, who accept the berth merely for a change without serious regard to the duties of the position, the real fault lies in the fact that the surgeons are underpaid. He censures the steamship companies, but says his suggestions to ship-owners to more fairly remunerate the surgeons have met with the reply that as long as the supply exceeds the demand there is no necessity for a salary increase.

We can appreciate the attitude of the companies, but from the standpoint of work well done their position is untenable. Not only are the surgeons limited to a pittance of \$50 a month, but on most transatlantic lines they are not allowed to charge passengers for services, except in cases where the illness or injury developed before the patient came aboard the ship. Such a custom is absurd in the extreme. If a passenger visits the barber shop, he pays the barber for any work performed. He also pays a fixed charge to the manicurist, the stenographer, and to every one else who is on the vessel in a capacity of similar nature.

On the other hand, a man can fall down the companionway stairs and fracture a bone, he can contract pneumonia or he can suffer an attack of appendicitis and his only duty on leaving the ship, if he is able to talk, is to thank the surgeon for his kindness.

Why should a man not pay his physician at sea as well as ashore?

If the lines throw in free medical and surgical attendance, why not the free services of the barber, manicurist, stenographer, et cetera, on the vessel?

If the owners in common justice cannot properly remunerate the surgeons should not the government inter-

ferre and insist that the medical officers of all ships arriving at American ports be of such calibre and possess such qualifications as to enable them to reject diseased applicants for passage and thus assist the Public Health and Marine Hospital Service in preventing the entrance of those whose presence is a menace to society?

The annual reports of Commissioner of Immigration Williams and his chief medical officer, Surgeon G. W. Stoner, U. S. P. H. & M. H. Service, furnish ample food for reflection.

With this knowledge in mind and with the prospect of the inauguration of many new American steamship lines in view of the forthcoming completion of the Panama Canal and the employment of many American physicians as ship surgeons, the question assumes important proportions. We believe a committee from the American Medical Association, delegated with the proper authority, could take up this matter with the different companies signing American surgeons and eventually gain for them compensation in keeping with their duties and their high calling.

GLOSSARY

ACIDITY, LOW, where from disease or other cause, the amount of acid secreted by the stomach is insufficient for the purposes of digestion.

AMPULLA, the dilated end of one of the semicircular canals. Each canal is dilated at one end for the purpose of accommodating the sensory end-organs (hair-cells, etc.) of the vestibular nerve.

ANAEROBIC BACTERIA, bacteria that grow only in the absence of oxygen.

AUTOMATICALLY, without the intervention of voluntary effort.

AUTOSUGGESTION, suggestion made *by oneself to oneself*.

BILE, a complex fluid secreted by the liver and poured into the small intestine just below the point where the stomach (pylorus) joins the intestine. The bile, especially in conjunction with the pancreatic juice, plays an important part in the digestion of fats. In many cases of stomach disorder bile finds its way into the stomach.

CALORIC VALUE, the available energy of a substance expressed in terms of heat-producing power. A *calorie* represents the amount of heat necessary to raise one cubic centimetre of water from 15° to 16° C.

CARBOHYDRATES, one of the three great divisions of food-stuffs. The carbohydrates are represented mainly by starch and its derivatives, the dextrins and sugars. See **STARCH FOOD**.

CARSICKNESS, vertigo, nausea, vomiting, weakness, etc., caused by riding in street-cars, railways, etc.

CASCARA SAGRADA, a valuable laxative medicine derived from the bark of *Rhamnus Purshiana*.

- CELLULOSE**, an indigestible form of carbohydrate. It forms the cell-wall or covering of the starch granule and of vegetable cells generally. Wood fibre and the skeleton of vegetables consist mainly of cellulose.
- CEREBELLUM**, the *little brain* situated beneath the posterior portion (occipital lobes) of the cerebrum or brain proper. The cerebellum is the chief central organ of automatic or non-voluntary equilibration.
- COAGULATES**, see **COAGULATION**.
- COAGULATION**, the process of congealing or curdling, generally induced by heat, acids, enzymes, etc.
- COCHLEA**, the snail-shaped portion of the bony labyrinth or internal ear. It contains the organ of Corti, i.e., sensory end-organs of hearing.
- COCHLEAR NERVE**, that portion of the eighth cranial, or auditory nerve which transmits brainward impulses originating in the cochlear receptors (organ of Corti). The true nerve of hearing as distinguished from the other portion of the eighth nerve (the vestibular) which is concerned in equilibration.
- DEAF-MUTES**, persons deaf and dumb from infancy, as the result of congenital or early loss of hearing due to disease of the labyrinth or other defect in the auditory mechanism. Deaf-mutes have been shown by experiment and observation to be immune from the effects of galvanization of the semicircular canals as well as from rotation- and seasickness. Animals from which the labyrinths or internal ears have been removed are not at all affected by rotation or galvanism.
- ENDOLYMPH**, lymph lying *within the membranous* labyrinth. Between the membranous labyrinth and the containing bony labyrinth is found the *perilymph*, that is, lymph lying without and around the membranous labyrinth.
- ENZYMES**, peculiar substances evolved from living cells and having the power to induce chemical and physical changes on a large scale, apparently without entering into the reaction themselves or suffering loss, addition, or other change in the process. Recently the action of enzymes has been

compared to that of catalyzers, that is, substances that accelerate chemical reactions which would otherwise take place much more slowly. Thus hydrogen and oxygen will not readily unite to form water, but if spongy platinum be interposed the gases readily unite, although the platinum does not seem to enter into the reaction. Examples of enzymes: *ptyalin* or the *diastase* of the saliva which converts starch to sugar; *pepsin* of the gastric juice and *trypsin* of the pancreatic juice, both of which convert albuminous protein to peptone; *lipase* of the pancreatic juice, liver, blood, etc., which splits neutral fat to fatty acids and glycerin; *chymosin* or *rennin* of the stomach, which coagulates or curdles milk. The chemical composition of enzymes is not known. The activity of enzymes is permanently destroyed by high temperatures, e.g., boiling. The enzymes of the gastric juice act best in an acid medium. Alcohol in excess of 10 per cent. precipitates the enzymes from their solution in the gastric juice, thereby rendering them inert for the time being and retarding digestion.

EQUILIBRATION, the act of balancing or maintaining one's equilibrium, e.g., in standing erect.

FATS, one of the three great divisions of foodstuffs. The fats include butter, oil, meat fat, vegetable oils, etc.

FAT-SPLITTING, the decomposition of neutral fat into its chemical constituents, the fatty acids and glycerin.

FERMENTATION, decomposition of organic matter under the influence of ferments or enzymes.

GLYCOGEN, the form in which carbohydrate food is stored within the liver, muscles, and other organs as a supply of readily available energy for future use. When starch has been reduced by the digestive enzymes to *dextrose* (sugar), the latter is absorbed from the alimentary canal and is carried by the blood-stream through the liver, muscles, etc., where it is converted by an enzyme into glycogen and retained as such in these organs for future use.

HAIR-CELLS, cells, or tiny units of living matter, with hair-like processes projecting from the main mass or cell body proper.

HORIZONTAL SEMICIRCULAR CANALS, the two semicircular canals, one on either side of the body, which lie in a horizontal plane, that is, in a plane at right angles to the long axis of the body with the latter in the erect posture. See **PLANES OF BODY**.

HYDROCHLORIC ACID, a powerful corrosive mineral acid found normally in the gastric juice to the extent of 0.1 to 0.4 per cent. It is the normal medium in which *pepsin* exhibits its digestive activity. If there be protein food in the stomach when hydrochloric acid is being formed, the former immediately combines with the acid, forming what is called *combined hydrochloric acid*. The sum of the *free* and combined hydrochloric acid makes the *total* hydrochloric acid of the gastric juice.

HYPNOTIC SUGGESTION, suggestion made to persons when they are in the hypnotic state. Post-hypnotic suggestion is suggestion made to a person in hypnosis that he shall or shall not do a certain thing some time after he has been taken out of the hypnotic state.

HYPODERMICALLY, *under the skin*. Medicinal substances, water, etc., are frequently administered in this way by means of a hypodermic needle and syringe.

INTERMEDIARY METABOLISM, see **METABOLISM**.

INTERNAL EAR, the innermost, or most deeply seated portion of the auditory apparatus. The latter is divided into three parts, viz.: (1) the *external ear*, which includes the visible ear and the canal or opening leading down to the eardrum; (2) the *middle ear* or tympanum, which consists of a cavity bounded on its outer aspect by the drum membrane or *drumhead*. Across the cavity of the middle ear stretches a chain of small bones (ossicles) which conduct the sound-waves from the drumhead to the labyrinth or inner ear; (3) the *internal ear*, which consists of the semicircular canals, the vestibule, and the cochlea. The internal ear lies deeply buried within the substance of a very hard bone (the petrous bone), and in it are found the sensory end-organs for hearing (in the cochlea) and for reflex (non-voluntary) movements of balancing (in the semicircular canals and vestibule). See figures in Chapter III.

INTRAVENOUSLY, within the veins. Medicinal substances, water, etc., are frequently thrown directly into the bloodstream. Given in this way quicker effects are obtained than even by the hypodermic method.

LABYRINTH (BONY), the bony structure situated within the substance of the temporal bone and consisting of the semi-circular canals, the vestibule, and the cochlea. Also called the internal ear.

LOCAL MECHANISMS, see **MECHANISMS**.

MECHANISMS, the structures concerned, and the part played by each in the production of phenomena or reactions.

METABOLISM, a term used to denote those changes that occur in foodstuffs from the time they are taken into the body by absorption from the alimentary canal until they are eliminated in the excretions. The initial and terminal changes that foodstuffs undergo soon after entering, or as they are consumed in the tissues and eliminated, are in most instances fairly well known. The changes, however, which foodstuffs undergo in the intermediate processes are by no means so well understood. These intermediate changes are included under the term intermediary metabolism.

NITROGENOUS FOOD, food containing the element nitrogen. Another name for protein food.

NYSTAGMUS. Co-ordinated jerky movements of the eyes which enable us to see moving objects accurately and continuously without lapse of vision.

OTOLITHS, the ear stones in the vestibule which, on change of position, etc., evoke reflexly the adjustments necessary to preserve or restore equilibrium. The otoliths act by inertia or gravitation, bending the hairs to which they are attached. See Chapter III.

PAIRED SUPERIOR AND POSTERIOR CANALS. Each of the two superior canals lies in the same plane with that one of the posterior canals which is located on the opposite side of the head; consequently each superior canal is paired in function with the posterior canal of the opposite side, and as a result the two superior canals are paired against the two posterior canals where the body is rotated in the mesial or sagittal plane.

PANCREATIC JUICE, the secretion of a large, important, digestive gland situated in the abdomen. This juice contains enzymes or ferments that in an alkaline medium act upon all three classes of foodstuffs, viz., fats, carbohydrates, and proteins.

PLANES OF BODY. With a person standing erect the following planes of the body are defined for purposes of anatomical description: (1) the median, which is the vertical plane through the middle of the body from before backward; (2) the sagittal, which is a vertical plane from before backward, parallel to the former but passing not through the middle of the body but to one or the other side of it; (3) the frontal or coronal, which is a transverse, vertical plane from side to side, passing down through the body; (4) the horizontal, which is any plane passing through the body in a horizontal direction that is at right angles to the long axis of the body.

PNEUMOGASTRIC NERVE, the vagus or tenth cranial nerve. One of the most important nerves in the body, since it is actively concerned in the functions of the heart, lungs, stomach, intestine, larynx, and other important organs. See **VAGUS NERVE**.

PNEUMOGASTRIC TERMINALS, the peripheral endings or ultimate distribution of the pneumogastric or vagus nerve.

PROTEIN, one of the three great classes of foodstuffs; the nitrogen-bearing food represented chiefly in meat, fish, eggs, cheese, milk, peas, beans, lentils, etc.

PSYCHIC ELEMENT, see **PSYCHIC SEASICKNESS**.

PSYCHIC SEASICKNESS, seasickness induced merely by the imagination or thought of it.

PUTREFACTION, fermentation in which the products of decomposition are of a foul or offensive nature.

PYLORUS, the lower opening of the stomach through which food passes into the intestine. The pylorus is guarded by a strong, thick, circular muscle which relaxes intermittently to let food pass into the intestine.

SECRETOGOGUES, substances which, when taken into the stomach, tend to produce a flow of gastric juice.

SECRETORY FUNCTION, the function of secreting or separating certain substances from the blood for the purposes of digestion, etc.

SEMICIRCULAR CANALS, three small, bony canals which, with their enclosed three membranous canals, constitute a definite portion of the labyrinth or internal ear. See Chapter III.

SENSORY END-ORGANS, the beginnings of sensory or afferent nerves at the periphery or surface of the body where the sensory impressions are initiated which set up impulses in the nerves. These impulses travelling inward (afferent impulses) evoke subjective sensations such as pain, etc., or they may cause reflex, that is, involuntary activities in certain related muscles and other structures, e.g., glands, etc.

SPECIALIZED, developed or organized for special purposes or functions.

STARCH-DIGESTING FERMENTS OR ENZYMES. These enzymes find their way into the stomach with the saliva, being produced in the salivary glands. Hence the necessity of thorough mastication of all food. Starch-digesting enzymes also occur in the pancreatic and intestinal juices. They act best in an alkaline medium. See **ENZYMES**.

STARCH FOOD, one of the three great divisions of foodstuffs. It includes dextrins and sugars. Starch is present in large quantity in bread, cereals, potatoes, etc.

STIMULUS, anything that excites or rouses living tissue to action. A stimulus may be mechanical, thermic, galvanic, photo, etc., depending on the nature of the agency used to evoke reactions.

SUBACUTE, a somewhat less active grade than that of acute inflammation. Subacute are apt to last longer than acute conditions.

SUBCONSCIOUS IMPRESSIONS, see **SUBCONSCIOUS MEMORIES**.

SUBCONSCIOUS MEMORIES, a term used rather loosely by medical men to denote stored-up impressions (with their associations, complexes) which have been received under conditions of intense emotional excitement, etc., and which,

though outside the sphere of higher consciousness, influence to a greater or less extent the mental processes of the individual, causing serious reactionary disturbances in the bodily functions. Thus a child, on seeing a snake about to strike at her, fainted just as her nurse came to the rescue. Some time after the encounter the child, now grown to girlhood, began to have "fits" in which she apparently lost consciousness. At the onset of each fit the girl always exclaimed in terror, "Oh, the snake! the snake!" She had no waking knowledge whatever of any encounter with a snake, and she could offer no explanation of her customary reference to a snake at the onset of her fits. Failing to obtain relief from ordinary methods, the girl was hypnotized and in hypnosis she told the whole story of the snake incident. The nurse, who was in attendance on the child at the time of the incident, corroborated the story told by the girl in hypnosis. By means of counter-suggestion, made during hypnosis, the periodic recurrence of the "fits" was interrupted. From the practical standpoint it is perhaps immaterial to the physician whether the stored memories of such incidents be called "subconscious" or by some other term, such as coconscious, etc., so long as he properly understands the conditions before him and employs the proper means of treatment. Psychologists, with good reason, however, object to this use of the term subconscious as misleading and, indeed, it has given rise to much misunderstanding not only among physicians but also among psychologists themselves.

TEMPORAL BONE, a bone forming part of the side of the skull (the temple). Within this bone are situated the internal and middle ear and part of the external ear.

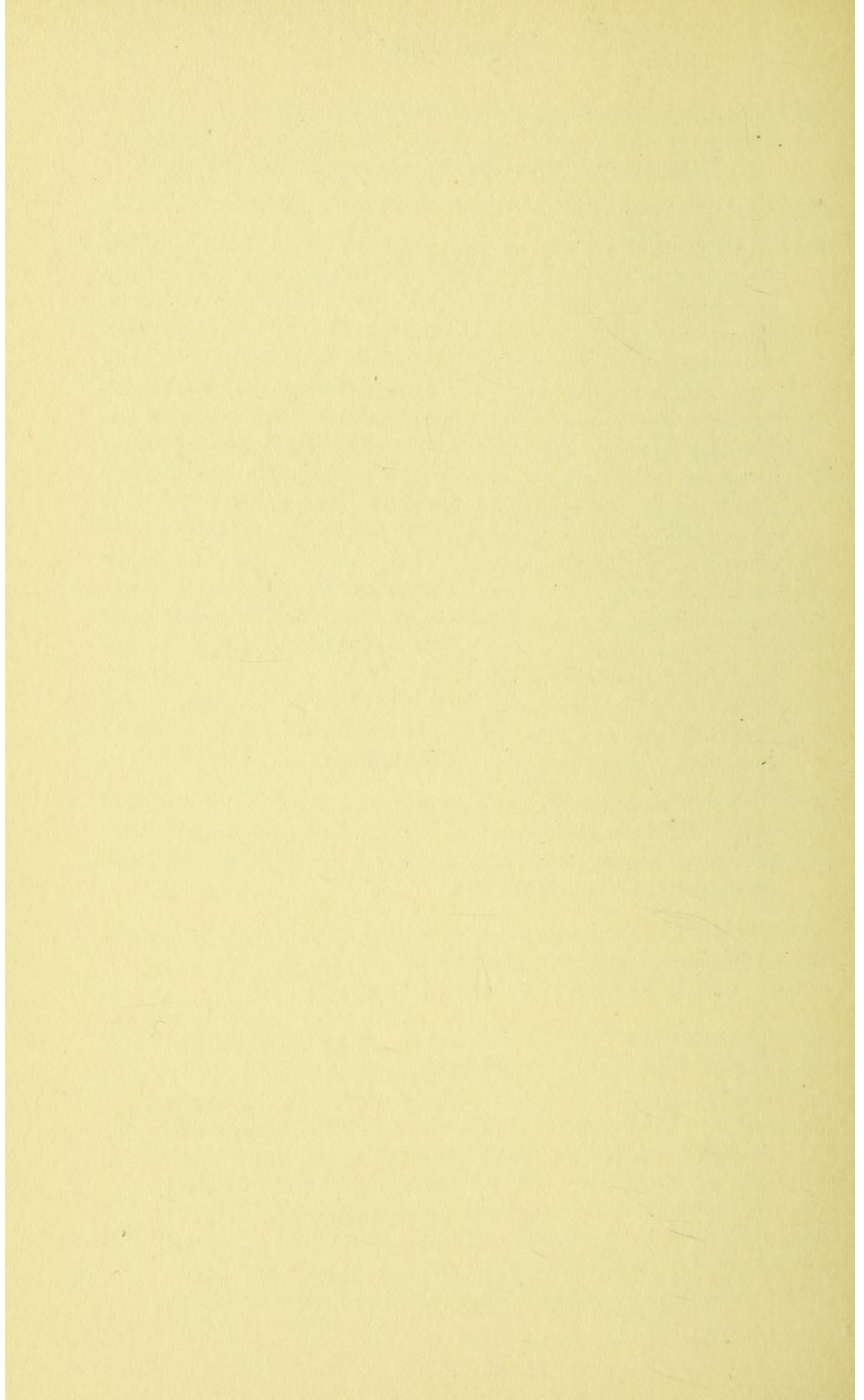
THRESHOLD VALUE. Stimuli, must have a certain strength or value before they can evoke their normal reaction or response. The resistance offered by the nervous mechanisms to the action of stimuli, whereby milder degrees of stimulation are prevented from eliciting a response, is called threshold resistance. The minimum strength of stimulus which evokes a response is a measure of this threshold resistance and an indication of the threshold value. As stated in the text, threshold values may be altered by numerous factors, such as heat, cold, fatigue, etc.

UTRICLE, a portion of the membranous labyrinth situated within the bony vestibule of the internal ear. It contains one of the two otoliths, the saccule containing the other.

VASO-MOTOR REACTIONS, see **VASO-MOTOR TONUS**.

VASO-MOTOR TONUS, an intermediate state between full dilatation of the calibre of the blood-vessels (chiefly of the arterioles) and full constriction. This condition is maintained chiefly by a constant stream of nerve impulses from the vaso-constrictor centre in the medulla oblongata. These impulses are sent out in response to all sorts of afferent impulses as from the skin, muscles, etc. As tonus in the vascular system is necessary for the maintenance of blood-pressure sufficient to insure the circulation, temporary paralysis or inhibition of the tonus mechanisms such as occurs after severe injuries, etc., is the chief factor in the causation of surgical shock. This, however, does not mean that failure of the arterial constricting mechanisms plays the chief rôle in the production of shock, for there are good reasons for believing that these mechanisms at least in the superficial, accessible portions of the body are actively functioning in shock and that the loss of vascular tonus occurs elsewhere, e.g., in the arterioles or venous walls of the splanchnic area within the abdomen.

VESTIBULAR NERVE, that portion of the eighth or auditory nerve which is distributed to the vestibule and semicircular canals. This nerve is exclusively concerned in the function of labyrinthine equilibration.



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