HABITS

Their

Effect Upon Life

THE NERVOUS SYSTEM

BY

SUSANNA COCROFT

AUTHOR OF

SELF SUFFICIENCY
GROWTH IN SILENCE
THE VITAL ORGANS
POISE AND SYMMETRY OF FIGURE
CHARACTER AS EXPRESSED IN THE BODY
IDEALS AND PRIVILEGES OF WOMAN
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"Train a child in the way he should go, and when he is old he will not depart from it." This proverb of Solomon is as true from the physical as from the moral standpoint.

The child who forms the habit of uprightness, of cheerful thought, of unselfish impulse, finds it just as hard to stoop to a mean act, to be long unhappy, or to be unmindful of others, as does water to remain on an incline. He may have occasional lapses, according to the pressure of circumstances or environment, but he never goes far wrong.

The right habit being formed, no matter how weak the will power, or directing energy, it is easier to follow the line of least resistance, and one does not deliberately and consciously try to do wrong.

The molecules in the brain cells become fixed in shape and arrangements, to conform to the character of thought in the growing child, as his bones or the contour of his muscles form their shapes.

Just as it takes definite, conscious, persistent effort to change the contour of a muscle, so does it take definite persistent effort to change a trend of thought and the resultant arrangement and shape of brain cells—hence one's nature.

Happily no habit or shape of brain and nerve cell is so fixed that it cannot be changed by conscious, persistent effort, else, started wrong, there would be no redirecting the thought, or correcting a wrong habit.

Cheerful thoughts, hence happiness, may become just as fixed a habit as the carriage of the shoulders or the manner of walk.

The purpose here is to show that morals or habits of thought—hence character—have a sound physiological basis.

The manner of movement, with the body in an upright attitude, is a muscular habit, formed by man, in distinction to the muscular movement of other animals. It is a habit acquired by each child after repeated attempts at educating the muscles to hold the child in an upright attitude. By the repeated efforts of the child to stand erect, the muscles take on forms of development, which enable them to hold this attitude without effort; just so, any sequence of mental action, frequently repeated, tends to perpetuate itself,—we are automatically prompted to think, feel and do what we have been accustomed to think, feel or do under like circumstances, without any consciously formed purpose. A song heard in the morning may travel over its nerve path repeatedly and "ring in the ears" all day.

Nothing is easier than to imagine that when a current has once traversed a path,

it will traverse it more easily, with each succeeding instigation.

In this way one memorizes. A child learns poem after poem and long passages which have no meaning to him, just by the repetition of sentences. It is supposed that the *first* nerve current must have been impulsive or reflex, and next have been a voluntary act of consciousness, or of the will.

The entire nervous organism is merely a system of paths, for conducting nerve impulse, through the sensory nerves to the nerve centers in the spinal cord and the brain, and back through the motor nerves to the part causing the sensation; or a path for the conveyance of conscious impulse from the brain, directed by thought. Just how this current is conveyed and the path formed, as explained later, under the chapter upon "Nerve Impulse," is not known.

Dr. Carpenter's statement that "our nervous system grows to the modes in which it has been exercised,"—just as a muscle changes its shape by exercise—ex-

presses the formation of habit concisely. This is particularly true of the nervous system, as is evidenced by the difficulty experienced in the effort to change a habit of thought current. The difficulty is partly because its very functional activity is occasioned by its incessant regeneration,—its tendency to reproduce itself; this tendency to reproduction is in the form and along the lines previously made,—the lines of least resistance.

Professor Wm. James says: "The most plausible view of the nerve current is that it is a wave of re-arrangement of matter which does not displace itself, but merely changes chemically, or vibrates across the line or turns itself around in its place."

The nerves are in states of varying tension, and the nervous system is constantly tending to equalize their states. If an obstruction to equalization occur in any part of the system, currents may shoot through new paths and new habits be formed, much as a stream, if the accustomed channel be blocked, would work for itself a new channel along the lines of least

resistance. The channel once made, it requires strong obstruction to change the course, because the banks harden to the form carved by the current.

Just as the formation of the shape of the river bank, becoming hardened and fixed, governs to an extent the future course of the stream, so do physical formations in the nervous system become fixed as a result of thought incessantly flowing in the same current, or reflex acts constantly repeating themselves. As the banks of a stream govern the current, thus do bodily habits once fixed, by very limitations in form of physical matter, govern or influence the thought.

The nerve substance is peculiarly plastic —reconstructive changes are constantly taking place in the nervous system, as in all other forms of organic matter, markedly similar to the changes in waste and nutrition occurring in all parts of the body, in the breaking down of tissue and repair by nourishment. It is not known, but it is probable that nerve changes conform to the

same law of metabolism as other bodily tissues.

"There is no part of the organism of man in which the reconstructive activity is so great, during the whole period of life, as in the ganglionic substance of the brain," but the plan of the building process is being constantly modified, and man, in adult life, is the expression of a bundle of habits, acquired during the growing period, —the required mechanism, which results during the reconstructive period, is thus maintained in the ordinary course of nutritive operations, so as to be ready for use even after a long period. This bundle of habits of body and mind characterizes the individual—designates the character.

Truly, as a man thinketh, so is he. This is not only a moral but a physical fact, for nerve and muscle conform in outline to his thoughts;—each thought makes a pathway through the nerves, which, if repeated, changes the location of nerve molecules, somewhat as plaster is moulded by the hand;—if repeated for years it becomes as set as plaster—"a fixed habit." To

change the form of the molecules where firmly fixed requires often some great upheaval of the emotional nature, or of the will, sufficiently strong to break up the pathway of nerve impulse. Thus occasionally one whose cells have been formed into abnormal grooves until on the verge of insanity, has this brain path broken by some strong upheaval of the emotions and he "comes to himself" again.

In the growth and reproduction of the nervous system, there is a decided tendency to produce a determinate type. This type is peculiarly liable to modification during early life, because of the plasticity of the nervous system. Thus habits are more easily fixed during the growing period—and character, which is a summing up of mental habits, more readily formed.

"Every state of ideational consciousness, either very strong or habitually repeated, leaves organic impression upon the cerebrum, in virtue of which that same state may be reproduced at any future time by some exciting occurrence." Poetry or

quotations learned "by heart" in early life fix themselves in the growing brain becoming a part of its normal fabric, and the mode in which it has been exercised is readily maintained by the nourishment conforming to the same mode,—like a scar, which is reproduced as the body changes. Quotations learned in early life, forgotten or dormant for years, come to mind.

The brain of a child being plastic, directing the thoughts and filling the brain repeatedly with beautiful, upright ideas is imperative, if he is to grow to uprightness; for his ideals become a part of the very woof of his being, and he can no more escape from them than he can escape from a scar in his flesh. Every train of thought, continually recurring to the child, is like a garden filled with perennials, which repeatedly renew themselves,—yet the thought is never uprooted.

Since the brain and the nerves actually change in construction, as a result of thought, it is apparent that mental and moral habits have a definite, physiological basis.

The law of physics that "a body in motion tends to keep in motion, or a body at rest tends to remain at rest," is simply an expression of habit.

The laws of nature may be said to be the laws of habit, to be accounted for in all organic and mental life upon a physical basis. The elementary atoms do not change but their arrangement in any compound matter may change, thus changing the shape and outline of the mass; this change in location of atoms, hence in form, may be wrought either by outward or inward forces,—if the matter be sufficiently plastic to admit of change.

A book opened to a certain page will open more readily to the same page again, because the molecules have changed places. The first step which a child takes is the hardest, each succeeding one becoming easier, until he walks almost automatically; —this is due to the ease with which the molecular changes are made in the young body and to the ready plasticity of the tissues.

A reformation, or change of habit, is then dependent upon the plasticity of the organic material. It would take an adult longer to learn to walk than a child, because tissues are less plastic; likewise a child learns to ride a wheel or to perform any physical feat more readily than an adult; yet, on the other hand, in the adult the will power to change, and the strength of character in carrying out one's purpose, are more firm.

It is here that regular, physical exercise, is helpful in the change of muscular, nerve and brain habits, because it tends to make tissue and cell more plastic. The freedom of the spinal nerves affects the freedom of brain cells and fibres, and the habit of thought is thus more readily changed where the physical formation is kept pliable.

Physical culture, to the average individual, means merely a series of physical movements, not extending beyond the bodily action; but if the regular exercise be accompanied by suggestion of the change needed in thought, the thought current

more readily makes new pathways because tissues are flexible and nerve centers freed.

The effort made by a few *scientific* men at the head of penal institutions, to introduce physical culture as a reformatory measure has a sound scientific basis. It is one of the most practical efforts yet put forth to change the habits of mind and body of the inmates.

Physical culture, therefore, when accompanied by mental suggestion, is a ready means for the change of thought and the formation of character. Thus the pertinent reply of the physical culturist to his brother who said that he had rather train the brain of an Aristotle than the body of a Samson:—"We physical culturists have more to do with the formation of Aristotles than you realize."

A change in tissue much more readily takes place a second time than a first; a tissue once conforming to a certain disease more readily succumbs to the same dis-

* Editors' Note:—The writer has been the means of changing the thought current, and thus the entire life and purpose of thousands of women, who had been discouraged and unhappy, by simple exercises to free bodily restrictions and by suggestion and guidance of thoughts, accompanying the exercise.

ease a second time. Catarrh, indigestion, headache, rheumatism, gout or other diseases, recurring until the abnormal condition substitutes itself for the sound one, become habits; when a habit is formed, we term the disease "chronic," and the substitution of the normal for the abnormal, simply means a knowledge of the hygienic laws of life and persistence in following these until the physical, molecular habit be changed.

The digestive, assimilative and eliminative forces of the body, form habits just as any other organic function.

The assimilative process of storing up fat within the body, is a habit which is halted, and a new one installed by diet and exercise. Likewise the nerves form habits of over-tension; this tension requires too much nourishment to supply the energy used, or otherwise interferes with the assimilative process, so that the body becomes thin and poor, being deprived of its natural reserve of energy in the form of fat. This habit is likewise corrected by special ex-

ercises for relaxation of nerves and by directions for diet and rest.

Epilepsy, neuralgia, neurasthenia, hysteria, and insomnia are illustrations of perverted nerve currents. Sometimes a medicine prescribed at the right time calls a halt and restores the natural functioning or reinstates the old habit.

In the nervous system, conditions recur and recur for no other apparent reason than the rule of physics stated above—"a body set in motion, tends to keep in motion, etc."

All neural activity or reflex action, referred to in the following pages, is the result of habit.

The habit of nerve irritability, of complaining, of being annoyed by people and the world in general, of unhappiness, are morbid manifestations of the inertia of the nervous system, which can be corrected by physical exercise, diet, cold bathing, and deep breathing of pure air. The change in the nerve habit is effected more quickly if a change of thought accompany the exercise, that the tension within the nerves

may relax—the nerve matter becomes more plastic, as the physical tension without relaxes.

"If habits are due to the plasticity of materials to outward agents, we can immediately see to what outward influences, if to any, the brain matter is plastic. Not to mechanical pressures, not to thermal changes, not to any of the forces to which all the other organs of the body are exposed; for Nature has so blanketed and wrapped the brain about that the only impressions that can be made upon it are through the blood, on the one hand, and the sensory nerve-roots, on the other; it is to the infinitely attenuated currents that pour in through these latter channels that the hemispherical cortex shows itself to be so peculiarly susceptible. The currents, once in, must find a way out. In getting out they leave their traces in the paths which they take. The only thing they can do, in short, is to deepen old paths or to make new ones; and the whole plasticity of the brain sums itself up in two words when we call it an organ in which

currents pouring in from the sense-organs make with extreme facility paths which do not easily disappear. For, of course, a simple habit, like every other nervous event—the habit of snuffling, for example, or of putting one's hands into one's pockets, or of biting one's nails,—is, mechanically, nothing but a reflex discharge; and its anatomical substratum must be a path in the system. The most complex habits, as we shall presently see more fully, are from the same point of view, nothing but concatenated discharges in the nerve-centers, due to the presence there of systems of reflex paths, organized so as to wake each other up successively,—the impression produced by one muscular contraction serving as a stimulus to provoke the next, until a final impression inhibits the process and closes the chain." It is by the effect upon the sensory nerves and by putting the blood in normal condition, that systematic exercise and diet affect the brain.

The restlessness of growing children is the effort of this brain energy to discharge

itself. It will not be suppressed, so its outlet should be directed in useful lines.

Habit simplifies life and is a great conserver of energy. As stated in the chapter upon Reflex Acts, if each movement of the body need be made consciously, the body and mind would be kept busy indeed, but all reflex acts, or the so-called acts of organic life, leave the mind free for directions which characterize the individual,—(See Page 83.

Think of the mental as well as physical fatigue which would be occasioned if the mind had to direct every act of digestion, assimilation, the heart action, etc., as well as the so-called conscious acts. If one needed to consciously direct each movement of the body, he would spend all day in performing an act which now seems simple, such as taking a bath or dressing the body.

Many habits seem to be partly automatic and partly volitional: one may knit and read at the same time,—the movement of the fingers being seemingly automatic; yet it is not entirely so, for, while the hands move rhythmically, without conscious

direction, there is a semi-conscious sensation in the muscles,—one *feels* the movement.

Singing is another semi-automatic movement,—one may sing a familiar hymn, the vocal chords directing the notes, while the mind is engrossed in some thought foreign to the sentiment of the song. The physiological explanation is that this habitual movement grows to the mode in which it has been exercised and then works automatically under the general control of the will. Thus does man consciously do two things at a time.

A reflex act works with greater precision than the conscious one. Cause the body to be awakened in the morning at a certain hour, and the reflex arc will cause its awakening at the same time each morning. One or two repetitions are sufficient to establish such habit.

Regular practice of any action not only makes that act easy and unconscious, but it eliminates fatigue; it also makes it accurate—more so than if the mind must consciously direct each action.

An automatic muscular movement, which is largely reflex, may be repeated for a much longer period of time without fatigue, than a movement which must be directed by the will or consciousness; it is an effort for the child to take the first step, yet with what ease it steps when the habit is formed.

In learning any new movement, energy is wasted in false motions, or in the inhibitory action of nerves, which are inclined to conform to old habits, and almost refuse to allow the muscles to move in new paths. When one has learned to waltz after a certain method, and the attempt be made to change one part of the step, the old habit insists upon enforcing itself, so that fifteen minutes of effort in changing the step is exhausting though one could waltz for hours in the habitual way without fatigue.

It is unfortunate that wrong actions become easier with each repetition, as well as right actions. Could there be a moral consciousness, which set the seal of right or wrong upon each act, and that consciousness preclude the repetition of a wrong or foolish act, no wrong habits would be form-

ed and how simple life would be! It would relieve human consciousness of the responsibility of deciding upon right and wrong and an infallible judgment would pass upon absolute right for all, instead of right or wrong being the outcome of social or civic custom.

The great thing in all education then, is to train the youth to form right habits, for right habits are the best capital a parent can lay up for a child, and each parent, no matter what the circumstances or environment, stands equal in opportunity for investment. The children of the rich and the poor may alike be given right thoughts and ideals of life, which form the moral habits; they may alike learn mental application, which will in the future make them powers in commercial, financial or civic life.

The child,—barring hereditary tendencies,—is given into the care of the parents as so much plastic clay. He is given the innate force for development in abundant energy. The direction to invest the energy in right habits is the most and

the best the parent can do. The playmates, the teacher, the friends, have much to do with the formation of habit, and the parents duty is to see that these be chosen with utmost care;—that the companions be upright in heart and mind, and diligent in application to duties, are the chief considerations.

The books which the child studies in school are not particularly to give him a knowledge of Greek or of geometry; in the great majority of cases, with the exceptions of the common branches of reading, writing, etc., this knowledge will not be put to a practical test. It is the following of consecutive thought, the development of the reasoning faculties, the training to mental application, which equip him to use these faculties in future years.

The manner in which the individual child is developing should guide the selection of his future studies. The cramming process from a standpoint of mental development, leads to a habit of gaining a smattering of much and a lack of real consecutive con-

centration and attention. It tends to superficiality.

Each child should be required to master tasks for which he has no special liking, if for no other reason than to acquire the habit of self-mastery.

By early training of the will, the thoughts, and the impulse, so that the nervous system is the help rather than the drawback, by constantly keeping at it along right lines, the individual will sometime awake to find his judgment relied upon and himself a power in the world,—and all this with less apparent effort than the man who is forever kicking against the pricks, because of lack of early training, and spasmodic, inconsistent efforts to change his habits. It is just as easy to form right habits as wrong ones.

The nerves are subject to training up to a ripe old age, yet there is no question but that the best time to train them is during their period of development. Before the eighth year, at which time, approximately, the brain attains its growth, habits are most easily formed, the anatomical growth

conforming to the habit of the brain; yet up to twenty years, the nerves, which are growing with other tissues, are particularly responsive to nerve training.

Accustom the fibres to carry and the cells to receive right nerve impulses. Through the medium of the nervous system, the different parts of the body are brought into harmony and the muscles into that co-ordination which tends to make bodily movements regular and effective in the execution of one's desires.

The more perfectly trained the nerves, the finer the co-ordination, the more accurate the body movements, and the less waste of nerve energy.

Why does the singer have a "true ear?" —Because of the training of the auditory nerve.

People say they cannot hear over a telephone;—one realizes that their trouble is due to lack of training, that their auditory nerves do not respond quickly to the stimulus of a sound carried over the wire. To the trained ear there is no difficulty.

During the early years of life, when the nerves and muscles are plastic, particularly during the first eight years when the brain is attaining its growth, the *moral* habits are established—so that the priest well says: "Give me the first fourteen years of a child's life and you may have the rest." During the period between twenty and thirty, the intellectual and professional habits are formed and by thirty, the capital of habits is acquired; the succeeding years are devoted to the investment of this capital in the application of the habits and the collecting of the interest.

The young man who is early taught self-dependence, self-control, the value and right use of money, with habits of industry and frugality, has his future life made easy for him; the longer this education is delayed the longer will he flounder and waste time in indecision as does the child in learning to walk.

The change of habit, depends upon the intensity of its first impulse and the length of time it has been fixed. The time required to change it, depends upon the

intensity and continuity of the impulse which prompts its change. The initiative in breaking up the pathway in the nervous system should be strong, and that pathway once disturbed, the change of thought will readily carve out a new pathway if the old path of thought be not traversed again.

"The question of 'tapering-off,' in abandoning such habits as drink and opium-indulgence is a question about which experts differ within certain limits, in regard to what may be the best for an individual case. In the main, however, all expert opinion would agree that abrupt acquisition of the new habit is the best way, if there be a real possibility of carrying it out. We must be careful not to give the will so stiff a task as to insure its defeat at the very outset; but, provided one can stand it, a sharp period of suffering, and then a free time, is the best thing to aim at, whether in giving up a habit like opium or in simply changing one's hours of rising or of work. It is surprising how soon a desire will die of inanition if it be never fed."—Prof. Wm. James.

The old path being broken, tends to form itself along the old lines with more susceptibility than to make new ones, so that if the will can stand the strain, no exceptions should be allowed until the new habit is securely rooted. "Attention! Right about! Face!" should be the Will's —the General's command. "Never to lose a battle" should be the unfailing watchword.

Where inherited tendencies exist, the will must be firm, or must allow itself to be guided by the will of another, until the new impulse be fairly launched.

He who hesitates is lost:—the action must promptly follow the impulse in changing a habit, for it is the *actual flow of the motor impulse which carves the decided paths;* the knowledge of its carving is remitted to the brain registering there the conquest, and nothing succeeds like success! One conquest foretells another. It is not the maxim, nor the purpose, but the *carrying this out* through the nerves to the tissues, which so stamps the impress of

success upon the very being and makes the next pathway easier.

The surest way to change a habit is to engross oneself in some definite work. "He who every day makes a fresh resolve is like one, who, arriving at the edge of the ditch he is to leap, forever stops and returns for a fresh run. Without unbroken advance there is no such thing as accumulation of the ethical forces possible, and to make this possible, and to exercise us and habituate us in it, is the sovereign blessing of regular work."—J. Bahnsen.

The habit of breathing, of poise, of carriage, of the accumulation of flesh, of the lack of flesh, of desire for unhealthful food or drink, of nervous irritability, of tired nerves,—in fact the habit of most chronic ailments can be changed; but, as is the case with the one who has an appetite for liquor, the habit is more quickly changed by "Attention! Right about! Face!"

It requires will power and strength of character to change, but, as stated above, the right habit, once formed, is easy, and

it pays to make the change. Excluding anatomical limitations one can almost be what he wills to be, either in physical form, in health or in mental strength and trend of thought, if the will be followed promptly by the action to accomplish. The difficulty with most is the lack of *determination* to change.

The world is full of people who *intend* to do, *intend* to accomplish, and, the world would see such a grand march of progress as would stagger us, if the action promptly followed the impulse.

Slaves to habit! The entire organism is a bundle of habits, tied together,—the nervous system making all connections.

Allowing good resolves and elevating impulses to evaporate, also becomes a habit and the individual and the world are the losers. "One becoming filled with emotions, which habitually pass, without prompting to any deed, keeps up an inertly sentimental condition which weakens." The church-goer, who week after week, listens to sermons which prompt him to deeds of helpfulness, unless he put these

impulses into action, is morally more responsible than the man who never felt the impulse. If the effort be accompanied by self-denial, the conquest is the greater. *Keep the effort alive,* and by watchfulness, innumerable avenues for helpfulness are opened.

The earlier the child is taught to form a habit of looking on the bright side of life, of expecting good and right in people and conditions, and so keeping the poise of mind, which tends to keep the nerves in a healthy condition,—the more certainly is his capital of future happiness assured,—for *happiness is a habit of brain and nerve poise.*

There is a class of people, who in early life, imagine themselves abused—a jealous disposition tends to turn their minds to thoughts of abuse whenever another seems more fortunate; if this habit become fixed, much thought and force are wasted in unhappiness, faultfinding and self pity, and by disagreeable thoughts their health is affected. The sympathy of the onlooker is directed to members of the family who

must spend their lives in an atmosphere of fault-finding and self-condolence.

While studying to find a combination of ingredients which shall directly feed and tone the nerves, will someone find a medicine which will act as a prophylactic for the companions of an individual who has allowed himself to form disagreeable nerve habits?

Worry soon becomes a habit of the discharge of nerve impulse, which, if repeated definitely fixes itself, as the path of this discharge becomes set.

The habit of letting little things annoy, and of keeping the mind's eye fixed upon small, nagging details, rather than upon the greater, broader things in life, is one of the greatest drawbacks to individual development and to national happiness and prosperity.

Could parents realize the physiological fact that happiness is an inherent, cultivated habit,—that it has a physiological form, which can be acquired and cultivated as any habit of walking or standing or of carrying the head or the shoulders, at-

tention would be given to training the mind to look for happiness within. The habitual scowl or worried look about the eyes of the growing child is a most important danger signal, indicating disturbed mental poise, and menacing not only the future happiness of the individual, but of those whose lives are touched by his. The habitual scowl or the happy smile extend themselves as do ripples upon the clear surface of a pond:—Who can calculate the far-reaching influence of a smiling face?

Let it be remembered that the one great purpose in life is the development and expansion of your own soul and helpfulness in developing others. Expansion and development come when the mind is in a cheerful, happy poise,—and one great duty in life is to add to the happiness of those whose lives are touched by ours. This can only be done by the formation of habits of mental poise, which keep one happy, for happiness is contagious, and the contagion is through the eye as well as the ear;—the sight of a radiantly happy face will dispel clouds of gloom.

Trials may be sent to try the mettle, or to purify, to cleanse, but the real development comes in the sunshine after the rain. The sunshine, the happiness is about us always,—it is for us to find—it does not come to us, it is within—find it and hold it,—*now*.

Prof. William James says: "The hell to be endured hereafter, of which theology tells, is no worse than the hell we make for ourselves in this world by habitually fashioning our characters in the wrong way. Could the young but realize how soon they will become mere walking bundles of habits, they would give more heed to their conduct while in the plastic state. We are spinning our own fates,—good or evil,—never to be undone. Every smallest stroke of virtue, or of vice, leaves its never so little scar. The drunken Rip Van Winkle, in Jefferson's play, excuses himself for every fresh dereliction by saying, 'I won't count this time;' Well, he may not count it, and a kind Heaven may not count it; but it is being counted none the less. Down among his nerve-cells and

fibres the molecules are counting it, registering and storing it up to be used against him when the next temptation comes.

"Nothing we ever do is, in strict scientific literalness, wiped out. Of course this has its good side as well as its bad one. As we become permanent drunkards by so many separate drinks, so we become saints in the practical and scientific spheres, by so many separate acts and hours of work."

Let no youth have any anxiety about the upshot of his education whatever the line of it may be. If he keep faithfully busy each hour of the working day, he may safely leave the final result to itself. He can with perfect certainty count on waking up some fine morning, to find himself one of the competent ones of his generation, in whatever pursuit he may have singled out. Silently, between all the details of his business, the power of judging in all that class of matter will have built itself up within him as a possession that will never pass away. Young people should know this truth in advance. The

ignorance of it has probably engendered more discouragement and faint-heartedness in youths embarking on arduous careers than all other causes put together.

"The great thing, then, in all education, is to make our nervous system our ally instead of our enemy. It is to fund and capitalize our acquisitions, and live at ease upon the interest of the fund. For this we must make automatic and habitual, as early as possible, as many useful actions as we can, and guard against the growing into ways that are likely to be disadvantageous to us, as we should guard against the plague.

"The more of the details of our daily life we can hand over to the effortless custody of automatism, the more our higher powers of mind will be set free for their own proper work. There is no more miserable human being than one in whom nothing is habitual but indecision, and for whom the lighting of every cigar, the drinking of every cup, the time of rising and going to bed every day, and the beginning of every bit of work, are subjects of express

volitional deliberation. Full half the time of such a man goes to the deciding, or regretting, of matter which ought to be so ingrained in him as practically not to exist for his consciousness at all. If there be such daily duties not yet ingrained in any one of my readers, let him begin this very hour to set the matter right."

THE NERVOUS SYSTEM

BY

SUSANNA COCROFT

Perhaps no part of the body is less understood than the nervous system; yet, due, partially, to the advance in surgery and the necessity of relieving the danger of the effect of the anesthetic upon the heart, investigations and experiments upon the nerves are engrossing the attention of scientific men. These experiments have led to a network of theories, with, as yet, few definite deductions.

The anatomy is fairly clear but the chemistry of the nerves and the physiological action, in the manner of conveyance of sensations to nerve centers in the spinal cord and the brain, the return of the motor impulse to the extremities, and the nature

of impulse incited by thought and emotion, are veiled in obscurity. The manner of thought production, as well as the manner of the transference of this thought to the nerves, and through the nerves to the muscles or to the vital organs, has also thus far eluded the definite deductions from scientific experiments.

Thoughts and thought influence, belong to the realm of psychology; the purpose of this lecture is to deal with such phases of the nervous system as the many experiments have proven to be facts.

The nervous system of man may very aptly be compared to the telephone system of a large city. The different wires in local districts of a city are collected into one local central office for that section. All local centrals are collected at one point and controlled by one Grand Central Station. The collections of nerve cells in the spinal cord, known as nerve centers, correspond to the local centrals,—the nerve fibres correspond to the wires. The brain is the Grand Central and is connected, through the nerve centers, with every part

of the body, except the hair, the nails and the enamel of the teeth;—the hair and nails give no sensation when cut.

When the telephone receiver is removed from the hook, a signal traverses the wire; this signal is received by the local central, and the reply is sent back over the same wire to the party giving the signal. In like manner, when a pressure is made upon a nerve in any part of the body, for example, if the finger be burned, the disturbance is called a sensation; this sensation is transmitted through the nerve fibre to a nerve center in the spinal cord, and the nerve center at once sends a reply through the same nerve trunk telling it to contract the muscles and draw the finger away. All sorts of messages, of varying importance, are sent to the spinal nerve centers, or local centrals. When they are of sufficient importance, or are unusual, the nerve centers call up the Grand Central, or brain, which answers the message; by far the greater number of messages, however, are answered by the nerve centers, without disturbing the brain.

On the other hand, the brain gives direct orders to the extremities through a local center, without having been called up by the extremity. Thoughts, in some mysterious way, direct such messages.

AUTHOR'S NOTE: I would advise a very careful reading of this book. Do not attempt to skim through it. The subject embraced is one of the most important studies, as knowledge of the construction and functions of the Nervous System is essential to success in cultivation of our physical selves. I have made every statement as simple and clear as the English language permits and have avoided where possible, all technical words. However, it is absolutely necessary to use some of these words, because words in ordinary usage will not exactly express the ideas. Read it several times; it will become clearer each time you read it.

STRUCTURE OF THE NERVES

Nerve Cells

The entire nervous system is composed of cells and their branches or processes, which are known as fibres. The cell with its branches is called a neuron. The typical neuron consists of a cell body, with short branching processes called dendrites, and a single axis cylinder process, the axon or axite, which becomes a nerve fibre.

Nerve cells are originators of nerve force. They are formed of a gray colored protoplasm, the chemistry of which is but little known, surrounded by a pellucid membrane or capsule. They are of various shapes and sizes, some are spherical—others flat and more or less irregular. Most of them are exceedingly small, being microscopic, as may be realized when it is

known that there are thirteen thousand million nerve cells in the body, nine thousand million being in the brain alone.

Nerve cells are found in every tissue and

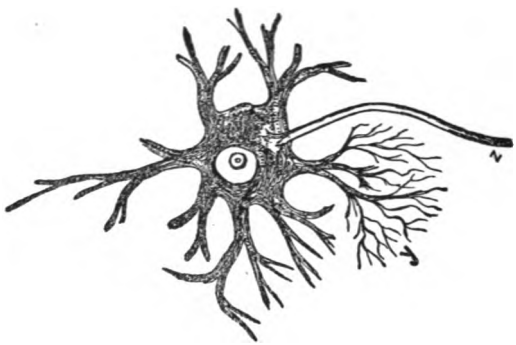

FIG. 1.—A multipolar nerve cell from the spinal cord, (neuron); z, axis-cylinder process; y, protoplasmic process.

organ in the body, as well as in the brain and the spinal cord. The cord has the same general appearance as a medullated nerve trunk, but cutting it transversely the gray cell substance is revealed.

Nerve Centers. A collection of nerve cells, which act together in the performance of some function, is called a nerve center.

Nerve Ganglia Collections of nerve cells arranged in groups, which are semi-independent, are called ganglia. In fact, every collection of nerve cells, or of gray matter, separated from other collections by nerve fibres, or white matter, is called a ganglion.

Nerve Fibres A nerve trunk is composed of bundles of nerve fibres, each one distinct and each capable of conducting force as are the wires of a cable, but so small that the individual fibre cannot be distinguished, a fibre being from 1/1500 to 1/12000 of an inch in diameter, varying according to the situation. The nerve fibres are mere conductors of nerve force; they convey impulses from the surface of the body to the nerve centers and back from the nerve centers to the surface; they also connect the nerve cells with each other and with the brain and spinal cord.

The axon or axis cylinder runs through the center of each medullary nerve as illustrated in Fig. 2, conducting force and impulse, somewhat as does a telephone wire,

the axis cylinder being the essential part of the nerve fibre so far as its property of conduction is concerned. The nerve force, as stated above, originates in the nerve cells.

FIG. 2.—Shows a medullated nerve fibre; A, axis-cylinder; B, white substance of Schwann; T, Ranvier's nodes.

The axon, being an overgrowth from the cell, is composed of the same kind of gray matter. Some of the axons, as soon as they leave the parent cell, acquire a white, fatty, semi-fluid coat called myelin, the medullary sheath, or "white substance of Schwann." Its function is not deter-

mined, though it is thought to protect and insulate the axon and possibly supply it with nutrition. When the fibres are gathered together into bundles to form nerve trunks, the white color is very apparent.

The white substance constitutes by far the greater part of the nervous system, though, as explained, not the most important part. It forms by far the greater part of the nerve extensions to all parts of the body, also the greater part of the brain and the spinal cord.

All nerves surrounded by myelin are called medullated nerves. The myelin, or protection sheath, is larger in large nerve trunks.

Surrounding the medullary coat is a delicate elastic sheath, visible to the naked eye and known as the neurilemma.

Those nerve fibres which have no myelin coat, but are merely axis cylinder processes from a nerve cell, enclosed in the neurilemma or sheath, are called non-medullated.

The above distinctions between the axis cylinder and the myelin are not visible in

the living body. They are only visible because of the changes in coagulation, etc., which take place after death.

Wherever the nerves are most exposed, there is most connective tissue, the purpose being to protect the nerves from injury. In the brain and the spinal cord, where the nerves are entirely protected by the skull and the vertebra, there is little connective tissue and the fibres are very small.

Each fibre in a nerve is completely isolated from all others and is capable of conveying uninterrupted impulse, just as each wire in a cable conveys an electrical current, and each has a distinct province, as in the case of the vagus nerve. Some of the fibres running side by side in this nerve trunk supply the heart, some the larynx, some the muscles of the stomach and intestines, some the glands of the stomach or pancreas, etc., thus illustrating that the nerves are groups of fibres, which have very different, independent activities.

Some nerve fibres convey impressions from the center outward to the peripheral tissues, as the motor or efferent nerves, and some from the periphery to the center, as the sensory or afferent nerves.

The nerves branch to all parts of the body in a similar manner to the branching of the arteries and the converging of the veins.*

The nerves vary in size from microscopic, out among the tissues, to a third of an inch in diameter in the large nerve trunks.

One of the largest, most important nerve trunks of the body is the sciatic nerve,—illustrated by Fig. 3. As a rule, the large nerve trunks follow the course of the arteries and lie near the bones, thus being protected by the muscular tissue. The sciatic nerve is an exception,—it runs behind the leg, while the large artery of the leg runs in front of the bone. This nerve runs into the foot and many pains termed rheumatic are due to a disturbance in it.

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* Publishers' Note:—See The Circulatory System, by Susanna Cocroft.

Sometimes the pain is experienced the entire length of the nerve, sometimes in the

FIG. 3. The great sciatic nerve at the back of the thigh and the leg.

FIG. 4. Nerves at the front of the thigh and the leg.

knee or the heel, and sometimes it is confined to that part of the nerve about the thigh.

CLASSIFICATION OF NERVES

By reason of the well defined distinction between the structure and province of the nervous system, it may be divided into two classes—the *Cerebro Spinal System,* which comprises the brain and the spinal cord, with the nerves proceeding from them, and the *Sympathetic System.*

The nerves are still further classified according to the impulses they carry:

1. A nerve carrying a sense of pain or pleasure, heat or cold, etc., is called a *sensory nerve.*

2. One that causes a muscle to act is called a *motor nerve.*

3. The tiny fibres hidden away in the walls of the blood vessels, causing them to contract and expand, are called *vaso motor nerves.*

4. Those which cause the glands to pour out digestive juices are called *secretory nerves.*

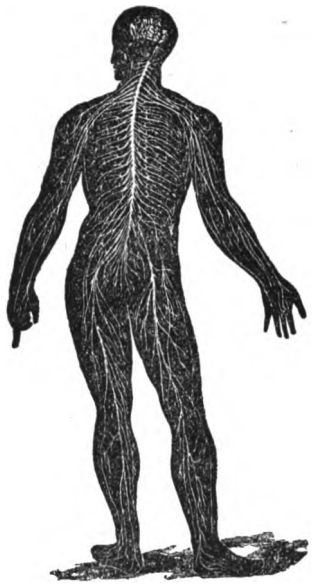


FIG. 5. Showing diagrammatically the cerebro spinal system of nerves.

5. The nerves which convey impressions from the periphery to the nerve centers are called *afferent nerves.*

6. Those which convey impulses from the centers to the periphery are called *efferent nerves.*

7. Those which restrain impulses are called *inhibitory nerves.*

Cerebro Spinal Nerves

The Cerebro Spinal nerves control both the voluntary and involuntary movements of the body.

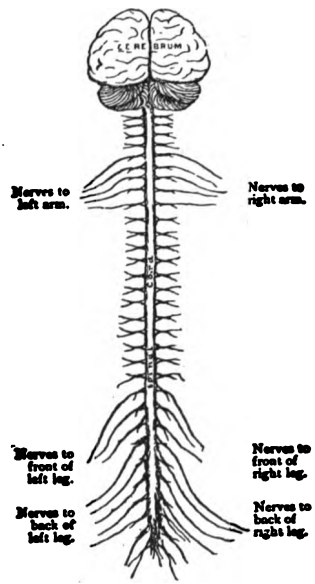


FIG. 6. The spinal cord and the brain showing the branching of thirty-one pairs of spinal nerves.

By voluntary movements are meant conscious acts, directed by thought; they are the smallest part of the nervous activities.

By involuntary acts are meant such workings of the body as sustain life, such as will go on without conscious thought;—these are directed largely by nerve centers in the spinal cord and the medulla oblongata. Examples of the involuntary movements are the workings of the digestive system, the metabolic activity among the tissues in the breaking down of waste and the assimilation of nourishment and the control of the circulation, of the heart, the breathing, etc.

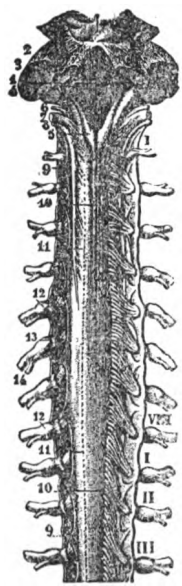
The Spinal Cord. The spinal cord, which is a part of the cerebro spinal nervous system, lies within the spinal canal or the vertebrae. It is continuous with the brain through the medulla oblongata, which is the name given to the upper end of the cord.

It does not occupy the entire opening in the cavity of the vertebræ, (this space is partially filled with blood vessels); neither does it extend the entire length of the spinal column. It extends from the skull, downward about eighteen inches, or to just about opposite the last rib, where

it divides into a bundle of small nerves, resembling a horse's tail. (See Fig. 5 and 6.)

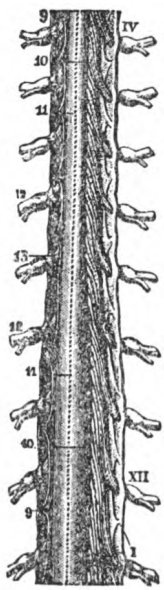
It weighs about 1½ ounces.

The spinal cord sends out thirty-one pairs of spinal nerves, which issue from either side of the spinal column, through small openings between the vertebræ; (See Figures 7, 8 and 9).



SUPERIOR OR CERVICAL SEGMENT OF SPINAL CORD.

FIG. 7.



MIDDLE OR DORSAL PORTION OF CORD.

FIG. 8

INFERIOR PORTION OF CORD AND CAUDA EQUINA.

FIG. 9.

The spinal nerves branch to all parts of the body, with the exception of the head. The nerves controlling the face and the head do not enter the spinal cord, but connect directly with the brain.

It will be readily seen that if a vertebra be out of place, in such a manner as to cause an extreme pressure upon any pair or pairs of spinal nerves, the nerve impulse through these nerves, as previously explained, will be restricted, while the nourishment to the extremities, or to parts of the body controlled by these nerves, may be interfered with. In extreme cases, entire paralysis of the body supplied by such nerves will result. It is only in extreme cases, however, that the vertebræ are forced so far out of position as to interfere with nerve impulse.

This theory of the interference with spinal nerves, by dislocated vertebræ, is the one upon which the school of Osteopathy largely bases its work. It is one principle, also, upon which the physical culturist must work. If the nourishment to any organ be interfered with because

of weakened nerves, attention must be given to regaining perfect freedom and strength of the spinal nerves controlling that organ.

The spinal nerves do not branch out as single nerve trunks, but arise by two roots, one from the anterior portion of the cord, known as the anterior root, and the other from the posterior portion, known as the posterior root;—(there is a small ganglion found upon this root just after it leaves the cord.)

The anterior root contains the motor nerve fibres, which convey motor impulse from the center to the extremities; the posterior root contains the sensory nerve fibres,—or the fibres which convey impression from the extremities. As these two nerve roots leave the spinal cord, they converge toward the vertebral opening, where they coalesce by the mingling of their fibres to form a compound or mixed spinal nerve, which after issuing from the vertebral canal, gives off anterior and posterior branches, each containing fibres from both roots, as well as a third branch to the

sympathetic ganglion. (Figures 10 and 11).

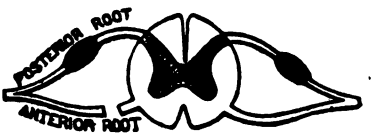


FIG. 10. Cross section of spinal cord and roots of spinal nerves, with anterior root cut; also showing ganglion on posterior root.

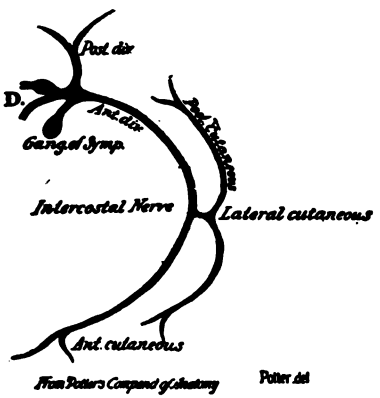


FIG. 11. Shows the manner in which the brachial plexus of nerves in the neck branches from the spine.

The spinal cord consists partly of white matter and partly of gray; the gray portion, occupying the center of the cord, is arranged somewhat in the form of the letter H, with the two upright prongs curv-

ing outward at both ends, (Fig. 10). The white matter entirely surrounds the gray matter.

Nerve cells are scattered throughout the gray matter of the cord, but they are arranged, more or less distinctly, in groups.

Effort is being made by surgeons to safely get within the spinal column, and reach the posterior nerve, so that an anesthetic may be applied to this nerve, so deadening it that no sensation can be received in the spinal cord, nor conveyed by the spinal nerves to the brain. This power of sensation being deadened, the operation might be performed with the entire consciousness of the individual, yet without pain.

As the nerve fibres of the trunk and the extremities reach the upper end of the spinal cord, they cross so that the nerves of the right side of the body enter the left side of the brain, and conversely—the nerves on the left side of the body enter the right side of the brain, thus in case of paralysis or a hemorrhage of the right

side of the brain we look for a paralysis in the left side of the body.

Sympathetic Nerves

The double chain of nerve ganglia, extending on each side of the spinal column, and in front of it, from the base of the skull to the coccyx is known as the Sympathetic Nervous System proper.

The sympathetic system, as the name implies, regulates the sympathy and the harmony between the different organs; it regulates the involuntary processes of organic life, or the acts beyond our control, such as certain processes of digestion, the cells of the liver, the pancreas, the spleen, etc. It is materially affected by the character of thought and emotion.

It consists of a series of ganglia, or collections of nerve cells connected with each other, and connected also with the spinal nerves. Physiologically and anatomically belonging to the same group, are various nerve ganglia about the visceral organs, such as the submaxillary ganglion near the submaxillary duct, the cardiac ganglia in the heart, extensive system of

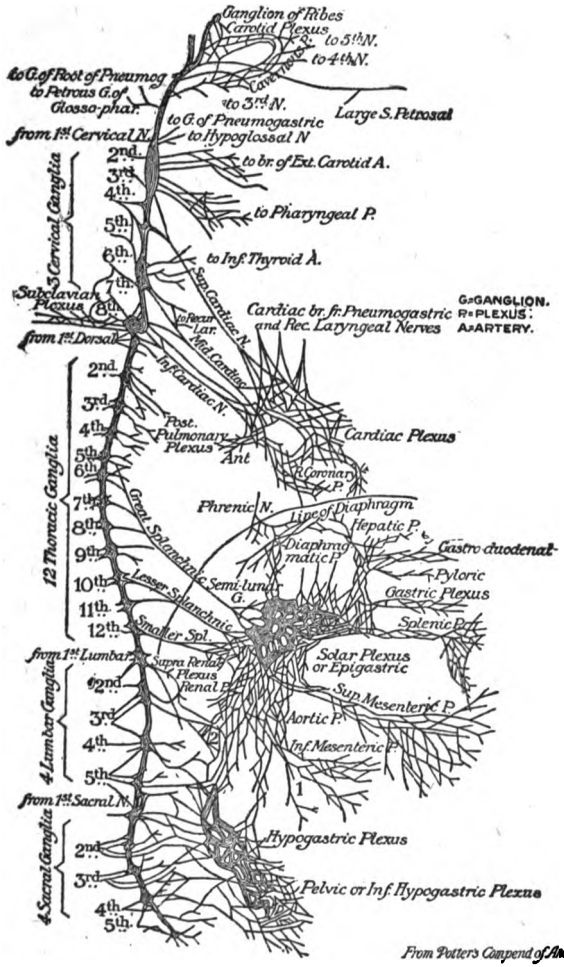


Fig. 12. The general outline of the Sympathetic Nervous System.

cells in the walls of the alimentary canal, the prevertebral ganglia in the abdomen, the semilunar ganglion from which arises the celiac plexus, and the superior mesenteric and the inferior mesenteric ganglia, which give rise to the hypogastric nerve, see Fig. 12. These ganglia lie ventral to the sympathetic nerve chain but they are in direct connection with it.

The sympathetic nerves lie so deeply imbedded within the body that it is difficult to get at them for experiment. They do not extend to the muscles of the extremities; but they send branches to all organs of the thorax, abdomen and pelvis; they also give off fibres to the nerves coming from the brain and the spinal cord.

The ganglia of these nerves vary greatly in size, some being invisible to the naked eye and others as large as a pea, occasionally even larger; while connected with the cerebro spinal nerves by communicating fibres, each nerve ganglion is connected with the other in the form of a complex chain, as illustrated by Figure 12. They surround the important vital organs and

control the function of these organs, but partially by virtue of their inaccessibility, the real action of the sympathetic nervous system is not entirely known. It is controlled more definitely by thoughts and emotions than is the cerebro spinal system, and it is through the sympathetic nerve effect upon heart and vital organs that the thoughts materially affect the breath.

According to Langley, the efferent fibres from the sympathetic nerve cells supply the organs of the involuntary processes of the body,—those which maintain life without volition; as it was termed in olden times—the vegetative processes of the body. Langley terms these efferent fibres controlling the vegetative processes, autonomic nerves.

While the sympathetic nerves have their rise in the central nervous system, they possess a certain independence of it. The spinal nerves are, however, connected with many of the sympathetic ganglia. Figure 12 illustrates diagrammatically the manner of connection between the central nervous system and the sympathetic nerves.

By reference to Figure 12, it will be noted how very closely connected are the solar plexus nerves controlling the stomach with the hypogastric nerves to the pelvis and abdomen.

It will be readily seen by this how disturbance in the abdomen so quickly disturbs the stomach. The large sympathetic ganglion, known as the solar plexus, is clearly shown on this figure. It lies posterior to the stomach, and in front of the spinal cord. This ganglion is so important in the control of vital life that ancients located the soul here.

With the exception of the ciliary muscle of the eye, which is partially under voluntary control, practically all of the sympathetic nerve fibres are removed from the control of the will.

Some of the sympathetic nerve fibres are white and others gray, appearing to consist of an axis cylinder without surrounding myelin.

The sympathetic nerves convey both sensory and motor impulses, but they act, as has been illustrated in case of adjust-

ment of the lens of the eye, more slowly than do the cerebro spinal nerves.

If the extremity of a sympathetic nerve be irritated by an injury or by pressure, because of inflammation or congestion of the vital organs, the reflex motion is slow. The slowness of this action is illustrated by the condition termed a "cold," which may not localize in a given organ under fifteen to twenty-four hours after the exposure causing the condition.*

It is hard to make one who has not had actual experience, realize how quickly the relief from a cold is established by vigorous exercise. The patient, as a rule, feels weak and disinclined to movement, but it is here that will power and strength of character show mental control of bodily functioning.

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*Publishers' Note:—For the physiological description of a cold, see Miss Cocroft's book upon Foods.

NERVE IMPULSE

The nature of the nerve impulse and the manner of its conveyance has always been of deepest interest to physiologists. For many years it was believed that the nerves were tubes through which flowed an exceedingly fine matter in gaseous form, known as "animal spirits." Again it was supposed to be a fluid and called "nerve juice."

At one time this nerve impulse was supposed to be identical with electricity, but more recent experiments have proven this theory to be false, as is illustrated by the fact that if a nerve be tightly bound, the transmission of the impulse is interfered with, but the electrical current passes through the constricted nerve without interference. When a nerve receives a sensory or motor stimulation, so that an im-

pulse is conveyed along the nerves, the electrical current is diminished in force. This would indicate that a sensory stimulation, being conveyed along the nerves for any great length of time,—such as is the case in derangement of any organ or tissue of the body,—the electrical current to the affected part being diminished, the nourishment to the nerve would be restricted.

All experiments have failed to determine just what this force flowing through the nerve is; later scientists have decided however, to term it "nerve principle" or "nerve impulse" until a more satisfactory solution of its nature has been reached.

Perhaps most physiologists believe the nerve impulse to be a progressive wave of chemical change, which is started at one end by the stimulus and is then self-propagated along the fibre, by change in the position of the molecules in the axon.

It has not been shown that waste is liberated in this chemical wave, however, as is the case of chemical action in muscles.

It has been found by the test of the galvanometer that there is an electrical current, independent of the nerve impulse, continuously passing through every nerve in a state of rest, this electrical current is more or less affected by the electricity in the air. Perhaps enough is known to justify the general view, that the electrical energy displayed, is derived, in the long run, from the metabolism of the cells;—a metabolism, which consists in the splitting of the substances, (whatever they may be) in the protoplasm of the cells.

It is definitely known that oxygen is consumed in this force, and the necessity of fresh air, during both waking and sleeping hours, is imperative.

Nerve impulse is increased, as are all metabolic changes, by friction produced by exercise, but more especially by friction produced by the chemical action of oxygen. Oxygen is thus an important element in nerve tonicity. For nerve strength, too great emphasis cannot be laid upon the importance of habits of full breathing.

Origin of Nerve Force.

The fact that the nerve force is originated in the gray matter is illustrated by cutting a nerve in two. All sensation and motion ceases in the portion supplied by the nerve which has been severed, until such time as the wound may heal and the severed part be knitted together;—then the power of sensation returns.

No nerve conveys impulse, either inward or outward, unless it be connected with gray matter in the nerve cells. This still further goes to prove the neuron theory that the axis cylinders are processes of nerve cells.

Waller showed that, if a nerve be severed, the peripheral end containing the axis cylinder will degenerate in a few days, while the central stump, which is connected with the nerve cell, remains intact, except for a short distance from the region contiguous to the point of severance. This experiment demonstrates that the nerve fibres derive their nutrition and receive their motor impulse from the nerve cells, and that there can be no sensation nor mo-

tion beyond the point of severance;—the severed part of the body is as free from connection with the brain, and thus from consciousness, as if it were a foreign body. The necessity of freedom and strength of nerve centers is therefore readily understood.

If the chemical constituents of the gray matter in the nerve centers were known it would be an easier matter to build up the strength of the nerve centers, by the right foods. *The only chemical constituent known to be necessary is oxygen.*

Rapidity of Nerve Current. In the cerebro spinal system of nerves, the nerve impulse is rapid, but not as rapid as waves of light or of electricity. It flows *about* 110 feet per second, but its exact velocity has not been determined. Supposing it to travel 110 feet per second, an impulse to go from the foot to the brain would require about one-twentieth of a second and the same to return.

Impulse, however, is conveyed through the sympathetic nerves much more slowly. This is illustrated by a person entering a

dark room from the bright sunlight. The pupil of the eye, in the sunshine, has been so contracted as not to admit an undue amount of light, and in going into the darkened room, in order to admit more light, the pupil must greatly enlarge. This impulse to enlargement is conveyed through the sympathetic nerves and it takes an appreciable time for the pupil to readjust itself. This adjustment of the pupil is entirely beyond our conscious control, as are all acts of the sympathetic nervous system, except as we control our thoughts and emotions.

The cerebro spinal nerves are the only nerves of the body directly within the control of the will.

Variations in temperature influence the irritability of the nerves and the rate at which an impulse is carried, the velocity increasing with a rise in temperature. Where the nerve force is dormant, cold baths are most efficient in arousing it.

Generally speaking, the limit of conductivity, lies between 32°F and 82°F. Cooling a nerve to 32°F, or the freezing point

will, in most cases, suspend the conductivity, but the functions promptly return upon warming. This is illustrated by freezing any part of the body, the chilled nerves not being able to conduct impulse, the part affected is said to have "no feeling." One feels the cold before reaching the freezing point, but when this is reached freezing occurs unconsciously.

The fact that 32°F suspends the conductivity of nerves is of the utmost importance to surgery, furnishing a convenient means of blocking nerve impulse in a nerve trunk for a desired length of time.

Anesthetics and narcotics, such as ether, chloroform, cocain, chloral, phenol, and alcohol act in the same way. They may be applied locally to a nerve, and if the application be made with care, the irritability and conductivity may be lessened or suspended entirely at this point, and be restored when the narcotic is removed.

Dentists suspend the sensation in the nerve of a tooth by the use of cocain.

It is interesting to note, also that the conductivity of a nerve may be suspended

by the deprivation of oxygen, as is illustrated in cases of suffocation or asphyxiation. This fact illustrates the importance of correct breathing habits, that sufficient oxygen may enter the lungs and the blood, and thus stimulate the conductivity of the nerves, so that they may properly and strongly direct the reflex acts of the body in digestion, assimilation, peristalsis, etc. *There is a better, a more natural nerve tonic in the oxygen of the air than in all the drugs of the stores, and if physicians would teach full, deep breathing and teach a patient to stand correctly, so that the lungs, heart and vital organs have room for movement, more permanent results in strengthening depleted nerve force would be gained.*

The conductivity of a nerve may also be suspended by pressure, without permanently injuring the fibres, provided the pressure be not too great. This is illustrated by the foot "going to sleep," when the legs are crossed in such a manner as to press upon the nerves controlling the foot.

The conductivity is often retarded by incorrect poise, which displaces some of the vertebra and causes a pressure upon spinal nerves. An upright poise of the spine is essential to free nerve impulse.

Reflex Action. Some nerve impulses are received and acted upon in the spinal cord, the impulse not reaching the brain; it is therefore, not a conscious act. The action in a muscle, directed by the nerve center, without consciousness, is known as reflex action, because the impulse received by the afferent nerve to the contracting muscle, at the periphery, is reflected from the nerve center. For example, suppose one has just touched, with his hand, a dish that is very hot,—instantly the sensation of heat is flashed over the nerve to the cell in the posterior horn of the spinal cord; the sensory cell hurries a message over to a motor center or cell in the anterior horn of the cord, and a motor impulse flies down the motor fibre causing the hand to be withdrawn before your brain has fairly realized you are burned.

This circle of nerve impulses is called a reflex act, but because it was a painful experience it rose to the dignity of a conscious act. The same cell, which sent word to the motor cell to have its nerve fibre at once withdraw your hand from the stimulus, also sent a message up to a sensory area in the brain, which registered the pain.

A large part of the reflex activities of the body are done unconsciously, however. If it were not so, the brain would be so fully occupied with the wants and activities of the body that it would have no time for mental exercise in the way of study, business, or bodily education or control. The nerve centers act as the brain's assistants, and, like the assistant in any line of business they execute the work planned; the manager, after instructing an assistant how and what to do leaves the execution to him, thus freeing his own mind from regular details, while he still keeps a general supervision and is notified if anything goes wrong. This is the attitude of the

brain toward the nerve centers, or reflex arcs.

The manner in which digestion is normally carried on is a good example of unconscious reflex activity. The act of swallowing is a reflex, the presence of food causing a motor impulse to be sent forth to move the muscles of deglutition; the food enters the stomach and its presence stimulates the ends of the sensory nerve in the mucous lining; sensory impulse is received in the spinal cord and an impulse goes back over the secretory nerve, which starts the juices flowing.

Still other sensory impulses are received and motor impulses go back to set up the muscular action called peristalsis.

The presence of water in the stomach or intestines gives the same sensory impulse and peristalsis results, moving the food along the digestive tract. Thus, where digestion is weak, water taken just before a meal starts peristalsis, and the flow of digestive juices. It is in conformity with this principle, that malts or liquors are taken before meals. They

should be taken only where the stomach is not eliminating sufficient gastric juices.

Normally all the digestive processes go on without our knowledge or consent. If however, some irritating substance, like a dose of castor oil, be taken, the sensory nerve fibres receive such a violent stimulus, that the message is not only carried to motor nerves through the motor cells, but is sent up through the posterior horn of the cord to the brain, because the motor nerve is acting so vigorously as to cause painful peristalsis.

Other reflex acts are the beating of the heart, breathing, coughing, sneezing, vomiting, the emptying of the bladder, parturition, etc. No brain impulse is needed for their performance.

A familiar example of reflex action, which demonstrates that this nerve force is sent from a nerve center rather than from the brain, is shown in the sudden jump or twitching of the muscles during sleep. It is not known what produces the sensation upon the nerve extremity; one theory is that the impression is made by

combustion of an undue amount of waste in any part of the system, due to sluggish circulation and to a failure of the system to regularly eliminate the waste during waking hours. Were one awake this nerve impulse would be inhibited, or restrained, by consciousness.

Nerve activity during sleep occurs most frequently when one is tired, because tired nerve cells do not properly instigate the removal of the normal amount of waste during waking hours; in nerve exhaustion, the breathing is not full, and the circulation is sluggish.

Another illustration of reflex action, which demonstrates also that nerve impulse originates in the nerve cells, and may be conducted without consciousness, is shown in the severance of the head of a chicken;—the nerve sensation of the fall to the ground is conveyed to the spinal cord; a change takes place in the cell of the gray matter and a motor impulse is sent forth which causes the chicken to flutter and throw itself about, convulsive twitchings taking place from one to three minutes

after the head is severed. After the removal of the head of a frog, if the toe be pinched, the sensation is conveyed to the gray matter in the spinal cord and at once the leg is drawn up out of harm's way. On the other hand, if the spinal cord be destroyed, the nerves remaining intact, no such result follows, showing that the cord has the property of receiving sensations and sending out motor impulses, without dependence upon the brain.

If a child's foot be tickled during sleep, the foot will be drawn out of the way without his awakening, unless the annoyance be unduly persisted in,—then a message is sent to the brain.

Familiar examples of reflex action, which illustrate the importance of this function in the preservation of bodily integrity are the instantaneous closing of an eyelid, when it would seem that some foreign article would strike the eyeball; the sudden recovery in falls or accidents; the involuntary step backward or forward removing the body out of harm's way, when a vehicle or a street car suddenly impedes the

progress. One is not conscious of the danger, as a rule, until after the reflex movement has taken place, thus showing that this reflex action is involuntary; yet it becomes a conscious matter after the mind has had time to act upon it.

When it is considered that all of the digestive and metabolic activities are controlled by this reflex action, that the nutriment is assimilated, etc., and the waste of the system is removed, and that the mind is left free for the instigation of comparatively few movements, it will be realized how the freedom, strength and nourishment of all nerves and the health and safety of the individual depend upon this reflex function.

Sensations Referred to Extremities.

A peculiar phenomenon, which puzzled scientists for many years, lies in the fact that an injury to any portion of a nerve along its course is always referred to the extremity of that nerve, as is illustrated by the singular phenomenon that if a leg be amputated, the amputated part may be left hundreds of

miles away and yet any sensation upon the end of the nerve in the part of the leg remaining, will be conveyed to the nerve center and to the brain, the patient actually feeling the sensation as if the extremity, which has been removed, were still in place. If it were not for his sight, he would not believe that his leg was not still attached to his body, because the sensation is exactly the same as if it were there. This illustrates nerve habit.

Again,—if one compresses or receives a sudden blow upon the nerve back of the elbow, the sensation is referred to the little finger, to the ring finger, and to the outer side of the hand, up to the wrist. The sensation is so keen in the fingers that it seems as if the injury were done there. Pressure upon this ulnar nerve interferes with the flow of nourishment to the extremities of the nerve.

A similar sensation is felt when by reason of the position of the limbs, the nerve of the leg, which supplies the foot, is compressed;—a tingling sensation is felt in

the foot, commonly expressed as "the foot asleep."

The tingling sensations in the hands, arms or legs at night are caused by pressure upon a nerve somewhere along its course; this pressure is usually due to the position of the body during sleep or to defective circulation and a consequent failure to eliminate the carbonic acid gas which presses upon the nerves, and stunts their sensibilities.

As long as the nerves remain in a natural and healthy condition, any portion of the body can incite the muscles to action. Each sensory nerve is supposedly endowed with the property of sensibility to pain, and of conscious sensation, as is illustrated by the nerve of a tooth which may be cauterized so that the nerve is incapable of conveying sensations of pain, yet it may convey the ordinary sensations; the patient may be entirely conscious of just what is going on in the extracting of a tooth and yet be conscious of no pain from it. This is also demonstrated in slight surgical operations;—narcotics so deaden the

sensation of nerves that one is unconscious of pain, but is conscious of movement and all other sensations.

Further experiments with the nervous system may enable us to differentiate between many other forms of sensation.

Investigation has determined that power of motion may be paralyzed though that of sensation remains.

THE BRAIN

The brain is that part of the nervous system which lies within the skull. The large convoluted masses of nerve substance are called the cerebrum and the cerebellum. Each mass is divided into halves called hemispheres.

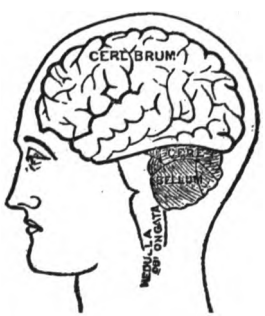

FIG. 13. Showing the medulla oblongata and the arrangement of the cerebrum and the cerebellum.

Besides these there are various ganglia of lesser size, situated on or near the under

surface of the brain. These ganglia are as little understood as is the action of the heart or of the sympathetic nervous system.

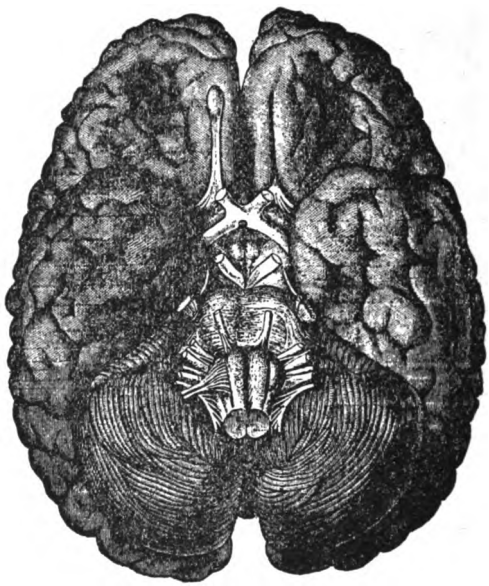

FIG. 14. Showing the under part of the brain;—the cerebrum, the large convoluted mass;—the cerebellum, the lower part with striated convolutions;—the pons, the white eminence at the base of the brain and at the top of the medulla oblongata; the medulla oblongata showing the base severed from the cord; the optic tract showing the crossing of the nerves; and the olfactory bulb projecting to the frontal lobe of the brain.

The optic nerves have their origin in these nerve ganglia and vision is retained,

even after the cerebrum is removed, providing the nerve ganglia which control vision, lying in the under part of the brain, be left intact.

In some one or all of these small ganglia, resides the power of sensation and motion; this is demonstrated by the fact that unless destroyed by loss of blood, life will continue and the body be still capable of sensation and voluntary movement after the cerebrum and cerebellum have been removed.

The brain, in adult life, weighs about 2½ per cent of the body weight; at birth it is 1/3 its mature size and is 12 per cent of the body weight.

The brain grows rapidly, becoming full size by the end of the eighth year, while the body may continue to grow until the eighteenth to the twentieth year.

As the brain develops, the nerves also develop.

The brain is composed of masses of nerve cells and connecting fibres. Each cell is more or less inter-dependent, while having each its own function.

The white matter fills the interior and forms the greater part of the mass of the brain, while the gray matter, or cortex, is spread over the surface.

The entire brain and spinal cord are covered by a membrane known as the dura-mater.

At the base of the brain, and above the medulla oblongata, is a convex white eminence known as the Pons. It consists chiefly of nerve fibres, but it contains also gray matter.

The Cerebrum. The cerebrum forms nine-tenths of the whole mass within the skull. (See Figure 14.) It is divided into two hemispheres by a deep groove, running from the front to the back of the head. A mass of nerve fibres run from one hemisphere to the other, on the under side of the brain; these serve as a means of nerve communication.

It is the highly developed condition of the cerebrum which gives man his pre-eminence over other animals.

The mass of nerve matter in the cerebrum is arranged in folds or convolutions, and the gray matter follows the convolutions, thus the gray matter is greater in quantity than it would be if the brain were smooth.

The brain substance itself is not a sensitive tissue; upon the cerebrum being exposed, it may be burned with fire or with acids without producing sensation.

Experiments in the removal of the cerebrum are not performed upon man, but many of the lower animals will live for months after the cerebrum has been taken out. The human brain being so plentifully supplied with blood vessels, death would probably ensue immediately upon its removal. It is supposed, however, that if the cerebrum could be removed without interference with the circulation, the human animal would continue to live without it, but would be a lower type of animal.

It is not definitely known, but experiments are practically conclusive, that the cerebrum is the organ of thought and reason. Prior to the second century, A. D.,

the ancients located the seat of intelligence in the heart, and the solar plexus. That the seat of intelligence is in the gray matter of the brain was established by Galent, by long process of experiments, which were of necessity, limited because of the danger of destroying the mental processes.

The frontal lobe, which we speak of as the forehead, is the seat of the intellectual faculties, memory, reason, the emotions and all other attributes of the mind, dependent upon its functional power. It is still an open question, however, whether other parts of the nervous system may not be endowed with psychical activities.

The greater the amount of gray matter in the brain, depending upon the size of the cerebrum or upon the depth of its convolutions, the greater the intelligence and the greater the reasoning power,—intelligence in animals increases in proportion to the increase in size of the cerebrum. Exceptions to this theory are known, but where a small brain exhibits a greater intelligence, it is usually found that the con-

volutions are deeper, thus admitting of a greater proportion of gray matter.

The elephant and the whale are the only animals whose brains are larger than man's, but they are relatively small in proportion to the size of their bodies.

One prime agency in determining the seat of intelligence to be in the brain, is that an injury to the brain is followed by impairment of the mental processes.

In a child the development of the mental faculties is dependent upon the development of the cortex, or gray matter, while in old age the impairment of the mental faculties goes hand in hand with the atrophy of the gray matter. The insane, or degenerate, show an abnormal condition of the cortical structure.

The disease known as softening of the brain, with the resultant mental maladies, the loss of memory, etc., is another evidence that the cerebrum is the seat of intelligence:—upon examination of a brain so diseased, it is seen that the cerebrum is in part diseased and that the actual im-

pairment, or disease of the mind, is the result of the impairment of this organ.

If the cerebrum be destroyed, the mental faculties are the only ones lost:—the sensory and motor functions are unimpaired.

Goltz removed the cerebral gray matter, or cortex, of a dog, a part at a time, at intervals of several months between, and it lived a year and a half—its memory records were, however, destroyed.

The gray matter of the cerebrum, is, therefore, the chief organ of psychic life, the tissue through which impressions of objective life are converted into the subjective images of consciousness. The nature of this conversion is unknown. The methods of scientific research are applicable to the investigations of the objective,—the physical and chemical, that is the material changes within the nervous matter,—but the psychical reaction cannot be approached by physical methods.

It is here that a little knowledge is dangerous;—the scientist, who believes that anything which is not applicable to physical law, and cannot be seen or felt objec-

tively, *is not,* has merely a smattering of physical knowledge. He says, "I know, because, etc." The man who has studied deeper, says: "There is a law of psychic force beyond the conception of physical sense, which physical science cannot reach." He has a courage to say, "I do not know." There is no doubt but that there is a psychico-chemical reaction in the brain, which can give a reaction in consciousness,—it is not matter.

Area of Sensory Organs.

When the belief that the cerebrum is the organ of thought, was reasonably established, the question naturally arose as to whether different parts of the cortex have different functions, corresponding to different mental faculties. Accordingly many systems of phrenology developed. Gall, a physician in Vienna, devoted his entire life to an earnest effort to establish his belief that different faculties of the mind are mediated through different parts of the brain. He conceived that the more developed any mental faculty, the larger will be that part of the

brain representing it, and, therefore, that since the cerebrum fits closely in the skull, the relative prominence of parts of the cerebrum may be determined by a study of the exterior of the skull. He did not take into consideration here that brains, small in area, may have deeper convolu-

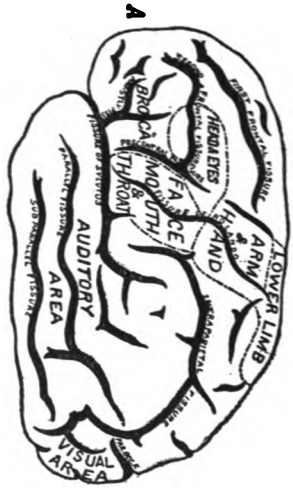

FIG. 15. Shows the probable location of the chief motor and sensory areas of the cerebral cortex.

tions, hence contain more cortical surface and more gray matter.

The most recent physiological conclusions modify Gall's theory. It is now be-

lieved that motor movements and sensory impressions, for different parts of the body, are acted upon by localized centers in the brain, as shown by Fig. 15, but that these different centers are intimately associated, and, to a certain extent, dependent upon each other for full functional activity. Fritsch and Hitsig in 1870 exposed the brain and applied an electrical stimulus to different cortical areas;—upon stimulating one area a distinct and constant movement of the limbs resulted; stimulation of another area resulted in a movement of the arm and the hand, another the face, etc. It is not known whether the sensory areas correspond to the motor areas, but it is known that the poise of the nerves of the body re-act upon the mental poise,—e. g.: If one assumes a physical attitude of despondency, the brain takes on a corresponding poise; if one assumes a bodily attitude of courage and uprightness, one is filled with courage and self-respect.

It may be that it takes generations and even centuries for character of thought to

so develop localized centers as to change the shape of the skull, but in the dispersion of the races, the Ayrans, whose minds turned to agricultural pursuits, developed a characteristically shaped skull; the Nomads, who lived wandering lives, another; and the Hamitic race another, supposedly due to the distinct character of thought attendant upon the nature of their occupations.

The brain center for vision, as shown in Fig. 15, is, as demonstrated by Munk, Ferrier and others, in the occipital lobes; if the occipital lobes be removed, total blindness results. Defect in the right eye would be felt most in the left occipital lobe, because of the crossing of the nerves.

Defective vision often causes pain at the base of the brain, because the optical nerve ganglia are here.

The location of the auditory area, as demonstrated by Munk and Ferrier, is in the temporal lobes,—ablation of these lobes being followed by complete loss of hearing. It is probable that the auditory

nerve fibres cross, as do the visual nerves, to the opposite sides of the cerebrum.

The peripheral end organs of smell consist of the olfactory epithelium in the upper portion of the nasal chamber.

Nothing is definitely known of the origin of the nerves of taste, but this area supposedly lies near the olfactory area.

Cerebellum. The cerebellum is often spoken of as the "little brain." It is situated within the part of the skull immediately back of the ears. Its average weight is about 5¼ ounces.

In the cerebellum, the proportion of gray matter is greater than in the cerebrum. It is arranged in about the same way, the convolutions in the cerebrum being deeper. In addition to the cortex, the cerebellum contains several masses of gray matter in the interior.

The exact function of the cerebellum is not known, but it is known that the cortex of the cerebellum presents a very complex reflex arc. The theory introduced by Flourens is generally accepted:—It is sup-

posed to harmonize and control the voluntary muscular contractions of the body, especially those concerned in the maintenance of the equilibrium and locomotion, and yet this has not been fully demonstrated. If it has, in any degree, to do with consciousness, the degree of consciousness is certainly inferior to that of the cerebrum, and expresses itself in the muscular sense.

Each half of the cerebellum is connected with its own half of the body but with the opposite side of the cerebrum.

Cranial Nerves. From the brain there arise twelve pairs of cranial nerves, which do not pass through the spinal cord as do the cerebro spinal nerves. All of these nerves, with the exception of the tenth control the head and neck.

The tenth is a mixed nerve, known as the vagus (wandering), or pneumogastric nerve. It is one of the most important as affecting digestion, the heart action and the blood vessels. The motor fibres supply the intrinsic muscles of the larynx, eso-

phagus, stomach, small intestines, and a part of the large intestine; inhibitory fibres are carried to the heart, and secretory fibres to the gastric and pancreatic glands; the sensory fibres are distributed to the mucous membrane of the larynx, trachea and lungs, and to the mucous membrane of the esophagus, stomach, intestines, gall bladder and ducts. These sensory fibres arise from cells in the ganglia on the trunk of the nerve.

Connection of Spinal Nerves with the Brain.

That sensations in the body may be felt, implies that the impression must have extended from the extremity receiving it to the brain; there must therefore be a connection between the nerve centers of the brain and the nerves of the body. This is true: "In addition to the varied and important functions performed by the spinal cord as a system of reflex centers, controlling the activities of numerous glands and visceral organs, as well as the so-called voluntary muscles, it is physiologically most important as a pathway to and from the brain.

All the innumerable fibres that enter the cord through the posterior roots of the spinal nerves bring in afferent impulses, which may be continued upward by definite tracts that end eventually in the cortex of the cerebrum, the cerebellum, or some other portion of the brain. On the other hand many efferent impulses originating reflexly, or otherwise, in different parts of the brain, are conducted downward into the cord to emerge at one or another of the anterior roots of the spinal nerves. The location and extent of these ascending and descending paths form a part of the inner structure of this cord, which is most important, particularly in medical diagnosis, and which has been the subject of a vast amount of experimental inquiry in physiology, anatomy, pathology, and clinical medicine."

Medulla Oblongata. The upper end of the spinal cord, just before it enters the brain and after it enters the skull, expands or becomes enlarged for about 1 1/3 inches of its length. (See Figure 13.) This en-

largement is known as the medulla oblongata. It is about ¾ of an inch wide in the individual of average size. It contains a small mass of gray matter, which seemingly is more essential for the active preservation of life than any other part of the body, because the nerve cells here control the breathing, the heart action, partially, and the circulation. The breathing movements are rhythmic and the blood vessels retain their tone so as to maintain an approximately normal blood pressure.

If the medulla oblongata be destroyed, or be severed from the underlying parts, life immediately ceases.—This would seem like a very small part of the body to have the function of the control of life.

The manner of capital punishment in some countries is inflicted through the medulla oblongata. In the large slaughter houses of the country, a man stands above the animal and, with a long spear, punctures the medulla as one animal after another is forced before him, death ensuing instantly. In the Spanish bull fights, the effort is always to strike this vital point.

If the brain be severed from the medulla, animals continue to live for a considerable period, the breathing and circulation being unimpaired; but, if the medulla be severed from the cord, death results immediately, because of the severance of the vagus nerve controlling the circulation and the nerves controlling the breathing.

In addition to the control of the circulation and breathing, the medulla controls the important reflex activities effected through the vagus nerve, which has its origin here. This is one of the most important nerve trunks as it partially controls the heart action, and it controls the motions and secretions of the alimentary canal. The importance of the medulla then will be realized, when it is recalled that it regulates breathing, circulation, the heart action, the digestion—the most necessary vital functions;—and it does this, normally, without consciousness, leaving the brain free for voluntary activities.

Control of Respirations.

The importance of neck exercises, and of exercises for the freedom

of the spinal cord and the spinal nerves is apparent, in order that all nerves of the medulla may be unrestricted. Breathing, which goes on almost involuntarily during the sleeping and waking hours, is controlled by the gray matter in the medulla oblongata in the following manner: "When venous blood, loaded with impurities, arrives at the lungs, the carbon di-oxide and other waste matter, accumulated in the blood, stimulates the nerves distributed throughout the lungs. This stimulation is conveyed to the medulla oblongata and the corresponding motor nerves convey the impulse from the gray matter of the medulla back of the chest, causing contraction of the muscular walls of the chest. These muscles contracting, expand the rib cage and inspiration takes place,—the air rushing in to fill the vacuum; the blood receives the oxygen, the air is expired again and the chest walls remain passive until the venous blood again accumulates in the lungs, in sufficient quantity to cause the requisite stimulus in the medulla oblongata; and so the process continues auto-

matically through long life, independent of the will of the individual; yet the breathing can be controlled to a certain degree by the will.—One can hold the breath for a short time, but with the cessation of breathing, the blood becomes so impure that a peculiar suffocating sensation is felt. If the breath be held for an undue length of time, extreme pain is felt and the medulla oblongata asserts its power, causing the muscular walls to contract."

Cause of Rhythmic Heart Action.

The cause of the rhythmic movements of the heart has naturally engaged the attention of physiologists for ages, yet we are perhaps no nearer a definite solution than in the time of Volkmann, who first taught that the activity of the heart is dependent upon the nerve cells contained in its muscular walls.

The central nervous system regulates the activity of the heart, but not its automatic rhythmic contractions,—the heart continues to beat when all the nervous connections are severed.

The theory that refers the automatic rhythmic heart beats to the contained

nerve cells, is known as the "neurogenic theory."

Another popular theory, known as the "myogenic theory," is that the muscular tissue of the heart itself possesses the property of automatic rhythmical contractility. Certain it is that the heart is an automatic organ; (by automatic is meant that the stimuli, which incite it to activity, arise within the heart itself, and are not brought to it through extrinsic nerves). Just what the heart stimulus is, is the problem.

THOUGHT CONTROL OF HEALTH.

The sympathetic nerves, which control the supply of blood to the blood vessels, are called the vaso motor nerves,—so named because they control the motion of the walls of the vessels, (vasa), producing their contraction and relaxation. The vaso motor nerves receive fibres from the cerebro spinal system, although they are chiefly of the sympathetic nerves.

A disagreeable thought or emotion, continued, so affects the vaso motor nerves that the capillaries of the skin are contracted and the complexion is affected, the capillaries being so contracted as to interfere with the nourishment of the skin.

Blushing is a phenomenon depending upon the control of the blood vessels by the sympathetic nerves; a thought of shame

or annoyance causes a dilation of the vaso motor nerves and the blood rushes to the superficial capillaries. The skin of the face being thin, the blush is noted more definitely here, though the same condition prevails over the body; it is often perceptible down into the neck and chest.

A blush illustrates also the slowness of the action of the sympathetic nervous system. It is never instantaneous with the thought of anger or annoyance which causes it,—it gradually increases and then gradually disappears. The only possibility of controlling the blush is in schooling the mind so that it may not be affected by thoughts of shame,—but who would wish to train the mind to be so callous? When one loses the sensation of being ashamed of a wrong action, much of the sweetness and affability of the character has been destroyed.

Owing to the fact that the nourishment to every tissue and vital organ must be carried to it through the circulation, and that all of the waste constantly being torn down and the poisons constantly being

freed, must be eliminated through the circulation, no subject interests physiologists more than the regulation of this function.

While recognizing the fact that the circulation is definitely affected by the vaso motor nerves, and that these nerves are definitely affected by thought, little has been done to regulate the thoughts of a patient "out of time" or to quicken the circulation through exercise;—the attention of medical science has been toward medicine—to regulation of the circulation through heart stimulants and drugs.

The effect of thought upon a patient is recognized in the selection of a nurse or a physician who is agreeable and in whom the patient has confidence. A nurse who is not congenial or a physician in whom one lacks confidence can defeat the results of medicine. Harmonious surroundings and thoughts play a vital part in the treatment of all diseases affected by the nerves —and what diseases are not?

Confidence in one's advisor is half the battle.

It was formerly believed that the circulation depended upon the elasticity of the blood vessels, but Claude Bernard, in 1851 demonstrated beyond a doubt, the vaso motor theory of regulation.

It is now known that the nerve fibres control the circulation in all blood vessels, with the exception of those of the brain, the lungs and the heart;—it has not been demonstrated that the vaso motor nerves control the circulation in these organs.

The importance of the nervous system in the regulation of nutrition, digestion, absorption and elimination, cannot be too fully emphasized, for the nerves direct the normal functioning of all bodily activity. The fact that a thought can so act upon the vaso motor nerves as to cause a constriction of the capillaries, forcing the blood out, so that it is noticeable in the blanched cheek, or flushing the capillaries as noticed in the blush of the cheek, shows the vital importance of the regulation of thoughts as a means in the control of health.*

* Publishers' Note:—See "Aids to Beauty," by Susanna Cocroft.

The fact that the process of digestion is presided over and regulated, mainly by the sympathetic nerves, which are so directly controlled by thought and emotions, illustrates just how the mental poise and the character of thoughts influence bodily nutrition.

The same class of nerves which cause a constriction of the capillaries of the face cause a like constriction of the capillaries in the digestive organs,—or, in fact, throughout the entire body, interfering with nutrition, circulation and digestion. It is through this effect upon stomach and intestines that disagreeable or unkind thoughts restricting digestion, absorption and nutrition, make one actually ill. The true physician directs the thought as well as the body, often recommending an entire change of scene. Where the change of scene to induce change of thought is not practical, a definite change of reading along helpful, cheerful themes is desirable.

All beliefs, therefore, religious or otherwise, which keep the nerves well poised, and the thoughts upon themes of happi-

ness and love, have a sound physiological basis in their effect upon the health.

Thoughts and emotions have also a very decided effect upon the pelvic organs;—the sympathetic plexuses controlling the stomach and the pelvic organs being so closely connected, (See Fig. 12),—disturbance in one organ is almost sure to affect another.

Anger, fear or strong, depressing emotions of any nature, may so over-stimulate and then exhaust the nerve cells as to cause nervous indigestion, resulting in innumerable ills which follow weakened nerves and impoverished tissues,—consequent upon the failure of the digestive organs to absorb proper nourishment.

Nervous indigestion is particularly difficult of correction because of its dependence upon both nerve and poise, affected by thought, and upon food.

Instances are numerous where extreme emotion so affects the nerves of the stomach as to cause it to refuse food for many days.

An even temperament is thus most conducive to health.

Nerve Exhaustion. It is believed that the nerve centers fatigue readily as a result of prolonged intellectual or emotional activity. This is implied in the necessity for sleep for recuperation after mental strain or emotional indulgence. All brain exercise, as well as all muscular exercise, must be alternated with brain rest, that Nature may have time to remove the waste and to re-build the tissue.

Sleep is the only complete rest from mental activity.

The amount of sleep required varies with different individuals, and with the tensity of mental action during the waking hours;—it is, therefore, a matter for each one to settle for himself. The average person, doing a normal amount of mental labor, requires from eight to nine hours' sleep. It is cited that Napoleon took only four hours' rest, but it must be remembered that Napoleon had the faculty of dropping to sleep in his chair, in his saddle, in his carriage or at his desk.

Though while in battle he took only four hours for complete rest, he made up for it most effectually after his battles.

During continuous brain effort, the waste is in excess of the repair, but during sleep the waste is repaired much more rapidly than the tissues are broken down, the only waste relieved being that occasioned by breathing, circulation, and digestion.

The sympathetic nerves being so closely controlled by thought and emotion, soon become exhausted by too long continued mental effort, or too long continued emotion. Thus Nature provides a partial or complete loss of consciousness, which gives the most complete relaxation and rest to the nerves.

The phenomenon of sleep may be referred directly to a lessened metabolic activity in the cortex of the cerebrum. The digestion, breathing and metabolism go on during this unconscious state as during waking hours, yet with decreased activity.

Nature is inexorable and when an excess of waste has been accumulated, brain ex-

haustion begins to express itself in wavering attention, loss of memory, failure to concentrate, and rest is imperative.

Nature requires a certain amount of rest after a given amount of effort and if one be deprived of sleep at one time it must be made up at another; if one has been on a long strain, when it is relieved, the desire for sleep should be gratified and just as soon as the amount of sleep required is caught up, Nature will no longer demand it.

The drowsiness that follows a heavy meal is probably due to an increased blood flow to the viscera and a corresponding diminution in the blood flow to the brain.

Perhaps the surest sign of exhaustion is in failure of nutrition. Where one grows thin, pale and languid, notwithstanding sufficient food be taken to supply both the tissues and the energy, it is an evidence that the nutrition has become impaired; this is probably the result of nervous exhaustion. Rest will accomplish wonders for such people.

Rest after systematic exercise, is more effective, because exercise creates a vigorous circulation, and the blood feeds the tissues much more freely after exercise. Systematic exercise just before retiring distributes the circulation, calling the undue blood from the brain, thus inducing sleep.

One needs also to cultivate a habit of nerve relaxation, so that nerve and muscle be not held on undue tension. This habit of relaxation may be gained through special exercises for the spinal nerves and the spinal column. Exercise also gives tone to the muscles; if they are flabby, they press upon the nerves.

It is to be remembered that if muscle fibres be under-nourished, that nerve fibres are also under-nourished and will not normally direct either the voluntary or involuntary movements of the body, consequently they will not direct the digestion, assimilation or absorption of the food.

Neither do tired nerves direct the elimination of waste with sufficient strength

and becoming clogged the poisons are absorbed into the system.

No tissue of the body is so dependent upon a good nutritious blood supply as the nerves and whatever treatment tends to build normal blood and causes it to circulate freely is the best medicine.

It is not known how the nerves appropriate the various elements in the blood to their use, but it is known that just as soon as the blood supply is shown to be insufficient or the blood to be abnormal, the nerves are the first to show it.

The best nerve tonic is exercise for complete circulation, nourishing food and full breathing of pure air.

Impure blood carries poisons to the nerve centers, which paralyze them and they cannot properly direct the bodily forces. Perhaps the most fruitful source of headaches is this nerve paralysis, resulting from inactivity of the liver, intestines, kidneys or skin, and a consequent failure of the system to eliminate the poisons.

ABUSE OF THE NERVES

The use of any food, or of any substance or diversion, which causes an exhilaration of the nerve force, followed by depression, or nerve exhaustion, and a craving for the food so effective, may be considered abuse of the nervous system;—in fact, any dissipation, followed by nerve exhaustion, is abuse.

Depression, following over-indulgence in any form, is a shock, whether it be caused by lack of sleep, which dissipates nerve force with frightful rapidity,—much more rapidly than it can be regenerated; by injudicious food; by too prolonged mental strain; by sexual indulgence, which calls for a secretion of some of the richest elements of the blood; by the use of alcohol, or drugs of any description. All

of these indulgences affect the sympathetic nervous system.

Recovery from such shocks is very slow; if one succeeds another, without giving time for recuperation, the injury to the nerves is extreme.

Perhaps the most common abuse is the undue tension of the nerves, by reason of prolonged mental strain, or a habit of holding disagreeable thoughts and a consequent failure to get the proper rest in sleep.

Alcohol. One common abuse of the nervous system is the use of alcohol, which enters into the nerve matter of the cells and fibres, rendering the composition of the nerve substance abnormal.

It attacks first the highest nerve centers, attacking those of organic life later on, and the changes wrought by its habitual use are the degeneration and actual destruction of the cells themselves.

The user of alcohol in excess, is in danger of acquiring a thirst and habit for it

toward which there in no physiological counteracting regulation.

When first taken, it creates a warmth within the stomach, probably due to the flow of an abnormal amount of blood, instigated by the irritation of the stomach nerves. After it has passed into the blood, so that it reaches all parts of the body, it has a peculiar effect upon the nervous system—first in a state of excitement, when the brain seems to become more active and thoughts come more quickly, and later in a loss of self control, with an increased tendency to laugh or cry immoderately.

Alcohol gives a sense of comfort and well-being which, however, is a most deceptive illusion, as the real comfort and well-being do not exist.

"It has been suggested that its apparent stimulating effect, may be due, in reality, to a paralysis of the inhibitory nerve centers, thus removing control and restraint and leading to a freer mental action." Observation would bear out this theory, as is illustrated in the freedom

given to speech and action when under alcoholic influence,—people of most reticent mental habits give up cherished secrets and talk volubly and at random, showing entire relaxation of inhibitory centers; the emotions dominate the intellect, and the judgment is weakened.

By a still more excessive use, the brain failure becomes more manifest, by dullness and stupidity—the valuable controlling mechanism is no longer apparent, it being to a greater or lesser extent paralyzed.

The man loses his capacity for his particular calling; that is to say, though he may perform the routine duties, he is incapable of any 'fine' work or of any advancement in such. There is a general lowering of the mental tone.

If the habitual use of alcohol be long continued, there is a gradual dimming of the sense of duty or responsibility, leading in extreme cases to an utter disregard of all honor and integrity.

"The dehumanizing influence of alcohol knows no parallel."

The marked changes in the nervous system can be detected by the microscope. To quote from an eminent authority:

"The diseased cell becomes swollen, the nucleus gradually is pushed from the centre towards the margin; the spindle-shaped bodies swell up, and their outlines become indistinct, and they gradually lose the power of taking on stains, the processes shrivel, empty spaces occur in the protoplasm, and finally the cell ceases to stain and cannot be seen.

There is an increase of connective tissue and of fatty matter. The nerve centers, as well as the fibres, become shrunken and wasted; small hemorrhages appear upon the brain; the latter may become softened and the enveloping membrane of the brain becomes thickened. The brain shrinks and the whole mass of brain substance is lessened, while the cavity of the skull is kept full by the serum from the blood.

"A cell damaged in this way never recovers, and so far as we know is never replaced."

Where the cells, by too frequent and excessive use, have been kept in a state of unrest, it takes considerable time for them to appropriate food materials, which they need from the blood; yet they do this. —Not, however, until after the cells have become thoroughly nourished by their natural foods, does the craving for alcohol cease.

The deadening of the sensibilities, produced by the entrance of alcohol in direct combination with the nerve cells thus preventing the normal nutritive changes, is termed narcosis. The fact that one loses the power of motion, shows that alcohol has affected the nerve centers of the cerebro spinal system, as well as the sympathetic.

The user of alcohol in excess, is in danger of acquiring a thirst and habit for it, toward which there is no physiological counteracting regulation.

When food or water is taken in excess, the body is satiated and the desire for food is no longer felt; in case of alcohol, how-

ever, the desire continues long after the nerve tissue has been injured.

"All liquors distilled from grain, potato, or other starchy material contain fusel-oil or amylic alcohol. New whiskey, gin, brandy or wines, which have been manufactured out of potato spirit, or to which this spirit has been added, contain this oil. In absinthe the oil of wormwood is found, which, if used even in underate quantities, develops a peculiar form of insanity with muscular tremors, giddiness and epileptic convulsions."

"We may sum up, then, the chronic changes produced by alcohol on the nervous system as follows:—In the first place there is a degeneration and ultimate destruction of the nerve-cells and their processes. In the second place there in an increase in the supporting tissue which replaces the nerve-cells, and which is entirely useless from the point of view of nerve action. This is merely another example of the increase which occurs in the supporting connective tissue of all organs, especially in the case of the liver and kidneys.

"Here, again, we have impressed upon us the fact that alcohol tends to shorten life, both by causing widespread degeneration and also by bringing on prematurely the special changes of old age.

"These changes in the case of the nervous system are, of course, especially to be dreaded because of the accompanying mental deterioration—a deterioration which frequently makes life a misery, and which, at the very least, renders it useless and ineffective."

Coffee.

Perhaps one of the most common abuses of the stimulants, is the free use of coffee. The very craving for this beverage in the morning indicates its danger, and it should at once be decided upon as a menace to the nerves and to the general health, particularly because of its stimulation of the heart action, and its effect in retarding digestion

Coffee is not a food. It contains practically no nutrition—then why drink it regularly as a food? The nerves should not be daily stimulated. If they need

more force, there are better nerve stimulants which do not retard digestion.

Chronic users of coffee, or alcohol, often experience muscular tremor upon first arising in the morning, which does not pass off until either a cup of coffee or a glass of liquor has been taken. When the user of coffee experiences this quivering of the nerves, if, instead of giving them a chance to re-adjust themselves and absorb their proper nutriment, he takes a cup of coffee to steady himself, he must rank himself as weak in will power as the user of alcohol, who takes a glass of whiskey to steady himself.

Many people who cannot rest at night may attribute their restlessness to the disturbance in the nerve centers caused by the habitual use of coffee.

Effect of Tobacco.

Nicotine, in tobacco, prevents the action of the secretory nerves, which control the flow of saliva, by paralyzing the connection between the cerebro spinal nerve fibres with the sympathetic

nerve cells, through which the fibres pass. (see Fig. 12). If used excessively, the heart action becomes feeble, the skin pallid and there is usually distress at the pit of the stomach.

The nervous system gradually accommodates itself to nicotine, and many users of tobacco do not experience especial ill effects, but the poison is there and the depressing effect is felt, though in slight degree, when the weed is used in moderate amounts; but it dulls the sensibilities, and because of this deadening of sensation, the user of tobacco feels that it rests him:—When one is worried, Nature's relief is in rest, and not in deadening the nerve sensations.

If used to excess, tobacco creates nerve irritability, due to failure of proper nutrition in the brain, by reason of a restricted blood supply, while wakefulness is produced by the over-sensitiveness of the nerve cells. The bad symptoms disappear more rapidly when the weed is no longer used, than do the effects of alcohol.

Opium or Morphine.

In small doses, opium produces sleep, followed by a very slow breathing, and a contraction of the pupil of the eye. When death occurs, it is due to paralysis of the vagus nerve centers controlling breathing.

Good opium yields 10 to 15% of morphine:—morphine is the most common form in which the drug is used. Small doses stimulate and large doses depress, but the stimulation of small doses is followed by gloom, depression and a gnawing at the stomach. After continued use, the memory fails, the will is broken, one is subject to neuralgia, sleeplessness, and partial paralysis of the backs of the limbs is common.

The opium user, as a rule, becomes untruthful, slothful, lacks ambition and is always looking for the gratification of some unnatural appetite. If its use be continued, it is supposed to produce a lasting alteration in the nerve cells.

Chloroform.

Chloroform is so rapidly thrown from the lungs that the period

of excitement from its use is very short. If continued, it retards the usual changes in the blood and produces a form of insanity. The drug is a very dangerous one, because an overdose paralyzes the nerve ganglia controlling the heart.

Chloral. In doses of from 15 to 20 grains, Chloral brings on a sleep very much like the natural sleep. This is a valuable drug in the hands of physicians, but like all other drugs, should never be touched without the physician's advice. If it be habitually used, the blood becomes thin and watery, the eyes and the throat become irritated and one experiences pain in the limbs and shortness of breath. Sometimes the lower limbs become paralyzed, while death may result from the gradual failure of the heart.

DERANGEMENTS OF THE NERVOUS SYSTEM

The diseases of the brain and of the nervous system, in their different forms and degrees of intensity, are too numerous to be discussed here. The purpose is to treat, briefly, only the forms of derangement or diseases most frequently encountered.

Before discussing nerve diseases, it may be well to note that *almost every nerve disturbance is brought about or aggravated by anxiety, worry, fear, or by the mind dwelling upon disagreeable thoughts.*

From the fact that insanity often results from the mind dwelling upon a certain train of thought, it may be inferred that a thought regularly persisted in, unduly tires the nerves or wears out special nerve centers.

In nearly all forms of nerve derangements the best remedy lies in nourishing food, in deep breathing of pure air, in regular exercise causing a good circulation, alternated with regular rest, and in change of thought. Sometimes the change of thought may come through a change in the character of reading, through change of companions or through change of scene;—change of scene means a change and diversity of thought.

Light exercises should be taken regularly, followed by complete relaxation.

Too great stress cannot be put upon the importance of the correct habit of full breathing and upon pure air night and day.

As previously explained, it is definitely known that oxygen is absolutely required for nerve tonicity, yet the lung tests of many thousands of women show that they habitually take into the lungs not more than one half of the air for which Nature gave them capacity.

The tendency to out door sleeping rooms will mean much to the nerve strength of the nation.

The individual suffering from a nervous difficulty, gets the credit, as a rule, of being ill-natured and disagreeable, while, in truth, such an one deserves sympathy more than the average bed-ridden person.

Physicians build up the nerves by building up the blood and the general vitality, thus increasing their supply of nourishment.

If the chemistry of the gray matter of the nerves were better understood, they could be fed special foods to nourish them, but the statement that fish, celery, etc., are good for the nerves, has no physiological basis, because of the lack of knowledge of the chemistry of the active nerve. They are good foods and easy of digestion, hence to be recommended in nerve derangements, as are all foods which require only slight digestive effort.

Nerve force and nerve tissue do not quickly respond to any form of treatment, because it takes some time to control thoughts and to build up the blood.

The difficulty with the average person suffering from nervous debility is that he

is in too great a hurry to recuperate. He has probably been years in causing the degeneration of the nerves and is not willing to give as many months to the rebuilding. It takes months and years, instead of days and weeks to rebuild nerve strength.

Neurasthenia (Nerve Tire)

With the American people, particularly, there probably is no more prevalent disease than Neurasthenia. This is a name derived from two Greek words, meaning "tired nerves."

Many individuals are seemingly "born tired." On account of the tired condition of the nerves, they are unable to properly direct the nutrition of the body and the slightest exercise renders them incapable; the body becomes under-nourished and often anaemic; the system then lacks resistive power and the person succumbs to one disease after another; one organ after another becomes exhausted, exhibiting a lack of functional activity, which results in chronic ailments.

One of the most common results of tired nerves is nervous indigestion. This is

usually the result of complications arising from other difficulties; the nerves not being sufficiently strong to direct the functional activity of the digestive organs the food fails to digest readily and gas forms as a result, causing fullness and often a pressure upon the heart.

People so afflicted often omit one article of diet after another, imagining that each particular article distresses them; this is a mistake, because it is the mere presence of food, more than the particular kind, which over irritates the delicate sensory nerves and abstinence from food leaves the system undernourished, thus aggravating the undernourished condition of the nerves.

Perhaps all people are victims, at some time in their lives, of neurasthenia, brought on by the using up of nerve energy faster than it has been generated. The nervous, highly active and restless temperament is most subject to it. It is usually brought about by over-work or over-anxiety, or by a mode of life, which lowers the vitality; or it is brought about

by cares and petty annoyances or exhaustive diseases. With women, too frequent pregnancies, too frequent indulgences, the drain of lactation or profuse discharges are aggravating causes.

It exhibits marked variations in its symptoms:—One of the earliest manifestations is irritability, followed by effort in physical movement; weakness of the mental faculties, as shown by the inability to concentrate the thoughts, efforts to do so causing headaches or vague pains about the head; confusion of thoughts; vertigo; sometimes syncope; restlessness; fear; weariness and depression; neuralgic pains about the body, with sensations of pricking and numbness; the head and neck feel weak; the spine becomes tender and sore spots may develop. Ocular disturbances sometimes result, coldness of the hands and feet, cardiac palpitation, chilliness followed by flashes of heat and sometimes by slight sweating. The patients are troubled with insomnia or fatiguing sleep, accompanied by unpleasant dreams. This may be due to deficient digestion and these

trivial disorders in the viscera may give rise to pains in the back. The natural state of the neurasthenic person is unstable and weak.

Mental rest, a change of scene, or avoidance of worry and anxiety, with exercise of light tension, followed by relaxation, nourishing food, deep breathing of fresh air, cold baths, and plenty of sleep, are the most effective remedies for the relief of this difficulty. Any physical drains upon the system should be avoided. The nerves should not be so stimulated that the reaction is exhausting, and the cold bath should be used with discretion. If the nerves do not react, one feels exhausted or chilled an hour or so after the bath. If this chilliness or exhaustion does not result, the cold bath, either a sponge or a plunge, will aid digestion and thus assist in the nourishment of the nerves.

Stimulants should be avoided, and the person should live out of doors as much as possible. Where nervous dyspepsia results, light exercises for the stomach, liver and intestines, deep breathing and cold

bathing are most effective. Pepsin may be used to assist in the digestion and where gas forms in the stomach and intestines, the pepsin may be accompanied by charcoal. The bowels should be kept regular.

While this difficulty is slow in recovery, the recovery, however, is positive, if attention be given to diet, exercise, fresh air and mental as well as physical rest.

The patient will help himself by dwelling upon cheerful, hopeful thoughts, and keeping his mind off his physical ailments, realizing that this nerve weakness may express itself in one organ after another, and that these difficulties are merely symptoms. The mind should be diverted and the body not over-taxed, either physically or mentally.

The tendency of one afflicted with neurasthenia is to dwell upon and discuss her difficulties;—this should be avoided. Such patients are easily affected by any statements by physicians or friends. The atmosphere about them should be kept cheerful and their thoughts, as much as possible, diverted from themselves. If a change

of scene is not practicable, will power in the change of thought by reading, and thinking along other lines and directing the thought from self to helpfulness of others, may be quite as effective. This requires strength of character.

The muscular weakness accompanying neurasthenia may result in muscle cramps or muscle atrophy, such as writer's cramp or the atrophy of muscles of the arm, resulting from too prolonged piano practice. These cramps are known as "professional neurosis."

Neuritis. Neuritis is inflammation of a nerve. It is usually confined to the neurilemma, or covering. As a rule, the inflammation extends the extreme length of the nerve. It is characterized by extreme pain and tenderness along the course of the nerve trunk and sometimes by paralysis of the parts supplied by the affected nerves. The pain is constant, but it may be accompanied by sharp needle-like stabs, or by a sensation of tingling or pricking of the flesh. If the affected nerve be a mixed one, that is, if it contain sensory

and motor fibres, spasmodic contraction and muscular cramps may result.

Neuritis is usually caused by compression of a nerve, somewhere along its course, or by cold and dampness. The pain may extend either upward or downward from the part first affected.

For relief of neuritis, the osteopaths work upon the theory that there is a pressure upon the nerve trunk which may be removed by manipulating the vertebrae. This relief is obtained by physical culture exercise for the spinal cord.

Repeated blisterings along the course of the nerve, hot water applications, and very feeble currents of electricity are helpful. Rest and quiet are imperative.

Neuralgia. Neuralgia is a severe pain, in paroxysms, along the course of a nerve and its branches. The true nature of neuralgia is unknown, but it is usually attributed to lack of nourishment to the nerve. One well known and practical scientist has called neuralgia "a call of the nerves for better blood."

It may be caused by colds, by a wound, by lesions of the central nervous system, by nicotine, malaria, typhoid fever, or alcohol, but the predisposing causes are anaemia and general disorders of nutrition;—in fact anything which interferes with the nutrition of the nerves may cause it.

Neuralgia of the face may be caused by caries of the teeth, which result in a pressure upon the nerve of the tooth, and interference with nutrition to the nerve.

Sciatica

Sciatic neuralgia is often confounded with rheumatism. The pain follows the course of the sciatic nerve through the thigh down the leg into the heel.

Sciatica often follows an attack of lumbago, but at times it is true neuritis, or inflammation of the nerve. The paroxysms of pain down the sciatic nerve last from a few hours to twenty-four hours or longer. If they last for long, they result in a wasting of the limb.

If promptly and properly treated, the neuralgias are entirely relieved unless

they result from a pressure upon the nerves caused by aneurysm, tumor, etc., then the cause must be first relieved.

A nutritious diet, deep breathing of pure air, and anything which affects the general tone of the system are the permanent remedies.

If the patient be anaemic, iron and a generous diet, with butter, cream, cod liver oil and exercise, with deep breathing of pure air are most effective.

Applications of hot water or steam give temporary relief, by bringing an abundant supply of nourishing blood to the affected parts.

Headaches. (Cephalalgia.) Headaches are regarded by many as affections of the sympathetic nerves. By others, they are referred largely to the vaso-motor nerves of the circulatory system. Whether referred to the vaso-motor or sympathetic nerves, the majority of headaches are caused by a pressure upon the sensory nerve fibres in some part of the body. This may be due to a failure of the

digestive system to fully digest, absorb, assimilate or eliminate the food, which thus ferments, resulting in poisons. If these poisons, in the form of carbonic acid gas, fail to be completely eliminated through the circulation, they press upon the delicate nerve extremities in the vital organs.

Any cause which lowers the general tone of the system, such as anaemia, tobacco, lead poisoning, products of defective assimilation in any form, sleeping in badly ventilated rooms, rheumatism, gout and neurasthenia, may cause headaches.

Congestive headaches result from undue mental exertion, calling an abnormal amount of blood to the brain. This is associated with full blood vessels, congested veins, throbbing arteries, vertigo and a feeling of fullness in the head.

The fact that headaches arise from such various causes must show the fallacy, to the thinking individual, of taking the ordinary headache medicine sold in drug stores, because the relief from the headache can only come from the removal of

the cause. The reason that most of the medicines allay the ache for a time is because they contain morphine or some other narcotic and simply stunt the nerve action.

Eye strain is a frequent source of headaches; these may be located at the base of the brain, or they may be frontal. Such headaches are sometimes relieved by glasses.

Headaches occur in children of nervous temperaments who use their eyes frequently, or tax their brains too consecutively, and are worried and anxious about their work.

The most general and most permanent relief from headache is exercise, sufficiently vigorous to create a thorough circulation of blood, deep breathing, that sufficient oxygen may be inhaled to relieve the waste of the system and to tone the nerves. Nourishing food and cold bathing also aid in this relief. The digestion should be strengthened and the liver and bowels be kept normally active.

When the headache depends upon the eyes, an oculist should be consulted.

(Migraine.)
Sick Headaches

Sick headaches most often affect those of nervous constitutions. Excessive fatigue, anxiety and worry cause them, yet they are probably most often due to poisons absorbed by the system, because of the failure of the liver to act normally, or of the intestines, kidneys and skin to throw off the waste.

It is frequently, though not always, confined to one side of the head, perhaps being most frequently localized in the left temple, though in a large number of cases it is diffuse, extending backward to the base of the neck or the top of the head. The pain is usually dull, severe and deep-seated, with stabbing pains from time to time. Noises, light and motions are depressing, sometimes vomiting occurs and often when the attack subsides, there is an abundant secretion of pale urine.

If the nutrition is impaired, as is frequently the case in neuralgic headaches, a nutritious diet, with exercise, cold water and active friction of the body with a coarse towel or brush will relieve them,

but the permanent remedy must come from the relief of the difficulty causing them.

Morphine gives relief to headaches, and most headache remedies contain this drug, but this is a dangerous remedy, because it may become a habit, and the relief is but temporary,—it simply deadens nerve sensations,—it does not reach the cause.

Exophthalmic Goitre. (Grave's Disease.)

There are many theories for the cause of goitre. Many believe that it is a diseased or perverted function of the thyroid gland, which throws a colloid toxic material into the circulation through the lymphatics, and that the symptoms that result are due to the presence of this poison in the blood.

Another theory is that the symptoms are entirely the result of a disturbance in the vagus nerve, the sympathetic nerves of the central nervous system.

Another theory locates the seat of the disease in the heart.

Thompson has a theory that the symptoms are the result of the presence in the

blood of poisons absorbed into the system from the intestinal tract, due to fermentation and decomposition there, or gastro-intestinal ptomaine poisons.

Mental anxieties and disappointments, disturbance in nutrition, anaemia, chlorosis, a drain upon the system by profuse discharge, or illnesses, are supposed to be the deep causes of this difficulty, yet scientists have not been able to determine exactly the cause nor the relief.

Based upon the theory that the condition is a nerve disease, and knowing that oxygen is one of the most essential elements in the rebuilding of the nerves, deep breathing, nourishing food and gentle exercise to create a thoroughly good circulation, so as to eliminate the poisons in the blood, are the surest remedies. Rest should follow the exercise and the body should never be fatigued. Freedom from anxiety and worry, with applications to allay the nerve irritability, are also important.

The pulse rate and the size of the glands have been known to be diminished materially by the use of the galvanic battery.

Paralysis, Apoplexy, Locomotor Ataxia, Hysteria, Meningitis, Epilepsy and Insanity are nerve disturbances, but their symptoms and cause are too intricate for explanation in this treatise.

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