

## X

### *The Rhythms of Energy*

Work always assumes some wave form. The particular form depends upon the kind of work no less than upon the personal peculiarities of the worker. Just as on the surface of the wind-swept ocean there are usually many systems of waves, ranging from fresh ripples to the long, deep billows surviving from a week-old storm, so in common toil: there are tiny pulsations in the individual muscle fibres, then a rising and falling in muscle masses such as those of the hands or the legs; then a general pick-up, peak, and waning of the body effort as a whole. One frequent wave form of the latter appears in factory jobs, where the worker advances through the day in periods of fifteen or twenty minutes each. At the trough of such working waves there should be—and often is—a rest. Then ensues a slow acceleration and warming up which bring the worker back to a new peak of output for ten or twelve minutes, at the end of which fatigue of a sort sets in, efforts weaken and slow down, and at length a new trough is reached.

Over and above these relatively fast,

brief waves there runs a long, low billow effect whose sweep has lately been studied by Rexford B. Hersey, of the University of Pennsylvania.

### BILLOWS

Working for nearly a year with employees of a large organization, Hersey studied the emotional ups and downs of seventeen normal men and women. He kept records of both their objective and their emotional behavior while on the job. He studied each worker's efficiency, his energy feeling, illness, absence from and lateness to work, accidents, pleasant or unpleasant verbal outbursts, and constructive ideas. Then he noted emotional attitudes as revealed by feelings of general hopefulness, contentment, indifference, tensions, irritations, worry, disgust, pessimism, anger, sadness, apprehension, suspicion and the like. Thirdly, he reported their dominating thoughts and reveries. And finally he studied aches and pains, blood pressure, weight, sleep and fatigue.

From these reports he was able to graph the emotional cycles of each worker's life. These he found highly individual. Every subject showed consistent periods of "ups and downs." And certain general tendencies came out. During the "high periods" the workers did their jobs with ease and uncomplainingly. However, they sometimes fell short of peak efficiency because they were too easily interested by external

stimuli. They would often stop their own work to supervise that of their neighbors. In general they adapted with ease to daily demands. They slept less than in the "low periods," yet did not feel tired. And they were much more active socially.

In the "low periods" they tended to do less work than usual unless driven. Often this low performance was compensated for by the fact that they stuck to their jobs better. They took French leave whenever they dared or had money enough, and they often had apparently unavoidable accidents, even though accidents are usually due to carelessness.

Hersey found that the emotional cycle did not correspond to any other familiar one, such as work, menstruation, and the like. This agrees with my own observations. The time between up and down may be almost anything from six or seven weeks up to as many months; whether it is fairly constant in a given person, however, I do not know. Hersey suspects that it is, though he did not keep records long enough to establish his conjecture.

With some people, the swing is so long and so slow that it is seldom noticed; hence it is not reckoned with in planning one's larger programs. In a few unfortunates the range between peak and valley is huge and destructive, as notably in manic depressives. The causes of the process are still beyond our ken, but they are plainly connected with the dominant brain

centers, the endocrines, and basal metabolism. We know this much at least, for within each up-and-down swing we observe changes in the person's thoughts, in his emotions, and in his gross bodily processes such as respiration and digestion.

I regard it as a fair guess, too, that the energy cycle may start at any point in the linkage. In one person, for example, a stubborn protein in a juicy sirloin may poison the system; the blood stream may carry the poison to the brain and there depress the centers regulating some endocrine gland, which in turn will slow down all bodily processes. In a second person, the retardation may begin with some unpleasant experience, brooding over which sets up inhibiting currents from brain center to endocrine; and the latter in turn acts as a brake on metabolism. In a third person, finally, there may be an inner cycle within one endocrine (or even a cycle caused by some interaction between endocrines), somewhat analogous to menstrual cycles; and this may alter the blood stream, which in turn affects the brain.

A change in the chemistry of the blood stream may shift the whole cycle. Of this I have ample proof in my own personal records following two tonsil operations. For some years before the first operation a slow poisoning had progressed unnoticed up to a critical point, when profound depressions occurred suddenly, persisted for a little while, then passed quite as

rapidly as they had come. As soon as the worst was over, the rise to a state of well being and general joy-of-living was completed in less than an hour. The range between peak and valley was very great, distressingly so, in fact. After the first tonsilectomy, which was incomplete, the cycle changed completely. The swing was vastly slower, much more even in up and in down, and the range was considerably less. Three or four cycles a year seemed to be the rule for nearly ten years; and the depressive phases of each were not only weaker but also vaguer, hence often ignored in the press of the day's work. At length they grew worse, a fresh diagnosis revealed the imperfectly removed tonsil, and another operation ensued—this time with the most striking change of energy cycle and emotional tone. The wave flattened after a month of convalescence. No more highs, no more lows. Now only a fairly even level of activity and a good emotional tone in the middle ranges only.

These long, slow swings seem to be very stable. They are not affected by work and rest, nor by ordinary mild sicknesses, nor by emotional excitement. In other words, they seem to have their foundations in some deep physiological surge. The practical significance of this is clear. Everyone should find out for himself as soon as he can how great this up-and-down swing is likely to be in himself. Business executives have enormously increased their efficiency merely by adapting their work to these perio-

diculties. Do your most important and difficult tasks when you are up and work in your periods of dull, routine, or unimportant tasks in your low periods.

### WAVES

Most of us have our daily ups and downs, too. Bodily energy is often low in the morning. Blood temperature rises during the day to a peak late in the afternoon, falling off to its lowest point early in the morning. A few people kept awake and busy during the night have succeeded in reversing the cycle. But as a rule night work is less efficient than day. This was demonstrated in a study of night and day women workers in a cartridge factory. While the hours of work were approximately the same, the night workers produced from ten to seventeen per cent less than day workers, and also lost more time. Many other investigations show that the quality of night work is inferior, while accidents are more frequent.

In some investigations, such as that conducted by the Life Extension Institute at the Solvay Process Company's plant, night workers show certain tendencies definite and frequent enough to mark them off from day workers. For instance, they suffered more from digestive disturbances, loss of appetite, and constipation. They also used tobacco in excess, though just why is hard for me to understand.

Night work is unhealthful, partly because of man's habits, which are adjusted to day work and broken with difficulty, and partly because night work apparently does violence to normal physiological rhythms which, if disturbed, result in general unbalance.

Some people work at peak efficiency early in the morning. Others never get going until after lunch. Still others are at their very best late at night. Rarest of all is the man who hits his pace as soon as he arises and holds it evenly until bedtime.

The morning worker has the advantage in every field of achievement which taxes the muscles. For it is during the hours immediately following sleep that ninety-nine out of every hundred men can exert themselves most strenuously, do things with the highest dexterity, and stick at a job longest without a bad slump. Fewer blunders and smoother performance can be counted on most surely in the first five or six hours after waking up.

No matter which muscles are called into play, the general rule holds. In practising foreign languages, in playing the piano or other musical instrument, in dancing drill, in elocution and acting, and in all the sports most people find it true. But it is complicated by many other factors, of course. For example, people do not seem so much alike in their early freshness of mind. Some wake up slowly and remain sluggish for hours, while others are alert at once.

Some can do nothing before breakfast, while others work at intellectual labors best on an empty stomach. As most high-grade work involves a blend of brain and brawn, the time of day when achievement is favored must depend upon the particular job.

### RIPPLES

All work is done in cycles of action and rest. Plainly these are physiological processes, some of which have been demonstrated in the laboratory, while others are so obscure and subtle that they elude measurement. The very composition of our blood undergoes a curious cyclic change.

A primary rhythm in energy flow appears in the hourly change in the number of white blood cells. The constancy of this rhythm is astonishing. Sabin, Cunningham, and Doan, at Johns Hopkins, have demonstrated that every person exhibits the same pattern here. The cells vary systematically in number from 5,000 to 10,000 per cubic millimeter. During the morning hours the rhythmic swing moves in the lower ranges of this total span. In the afternoon it moves in the higher ranges. That is, a man may show a rhythm of 5,000 to 7,500 early in the day, and a rhythm of 6,000 to 10,000 later in the day. His rhythm is not at all affected by eating lunch.

The lymphocytes have a still shorter



rhythm, and all of them are remarkably constant.

As far as we know, nobody has given any adequate explanation of these primary energy rhythms; but the facts are clear.

### SPLASHES

There are many conditions under which the energy of the ordinary man is suddenly broadcast with great violence. These diffuse explosions are those of rage, fear, and love. They are vast organic disturbances, starting with powerful discharges of secretions from the various endocrine glands and spreading throughout the motor and the associative sensitivity tracts of the autonomic and the higher cerebral regions. The entire body tends to be involved. The chemical composition of the blood is altered, arterial tensions change, fatigue poisons are neutralized, and the muscles receive more or less blood. After the first stages, there ensues a post-emotional condition of much longer duration, sometimes extending over days or weeks during which the energy level is either raised or depressed markedly and his entire life transformed for the time. For all practical purposes, he may even become "another man."

This much is sure. Now for the more or less doubtful evidences. It has been asserted that the shock of an emotional stimulus throws the organism, for the moment at least, into a chaotic

state. During this chaos the person makes few clean-cut adjustments to his surroundings, thus differing sharply from himself when executing an instinctive act, which is always neatly patterned, swift, and sure (though not sure of success). If the emotion is excessively intense, the chaos passes over into rigor and paralysis, which may become what biologists have called the death feint. This feint is supposed to be useful to the animal in fooling its enemies; and the stimulation of blood and muscle in rage is said, notably by Cannon, to be highly adaptive for combat, heightening the animal's endurance and reducing the loss of blood through wounds.

There is much truth in these views. But a certain demonstrable ingredient of error must be extracted painlessly. In the first place, the chaotic state is by no means universally associated with these primordial emotions. The extent and persistence of the chaos is closely correlated with the volume of energy and the speed of secondary sensitivities. And this amounts to saying that as the sheer power to do work and the richness of cortical associative structures increase, so does the chaotic tendency. Men and women of distinctly low mentality and only average energy will exhibit a certain amount of emotional confusion; but, as a rule, it is slight and evaporates swiftly.

For proof of this, see the ease with which they pass over to instinctive acts of a clean-cut nature, such as running from peril,

putting up their fists to fight, hiding behind a tree or rock to avoid a bullet, and so on. The aim of the psychopathic gunman who draws and fires at a foe in the first instant of rage is much more likely to be accurate than is the aim of a mentally normal man of equal ability in marksmanship under the same conditions. A lively memory, much free fantasy, and a strong tendency to reflect, anticipate, and plan greatly aggravate the initial emotional shock, whether it be pleasant or unpleasant.

It is easy enough to show why this should be so. The more high associative tracts are open to stimulation, and the more sensitive they are (which means the more unstable are their chemical compounds), the more easily will any given stimulus stream through all of them and induce in each one its own specific explosion. Now each such tract is connected with an enormous number of muscles; Sherrington inclines to believe that each one is coupled with every muscle. The tonus of the entire nervous system, as well as that of the muscles, is heightened in a specific manner by each major emotional reaction, by way of the endocrines. This means, on the one hand, that stronger stimuli reach the cortex in great multitudes while the cortical tracts are at the same time made more sensitive to all stimuli. This could have only one result. The inhibitions established by such mental habits as selective attention, frequency of use, and the like, tend to be overcome. The whole cortex is energized in

one upward rush of energy. And hence a horde of motor impulses are released which have no rational relation whatsoever. Everything tends to shoot off at one bang. Chaos follows.

Nowhere can this be more clearly observed than in the behavior of children. Here we are not confused by the interplay of elaborate and deeply rooted social habits, especially those of the inhibitory sort. The most chaotic outbursts of joy, terror, and fury will occur in boys and girls decidedly above normal in rate of learning, liveliness of imagination, and general alertness. True, the subnormal mental types in their early years also hurl their little fists the instant they are enraged, or run at top speed from an ugly dog, or indulge in juvenile petting of the love object. But the two classes differ in "hangover." The brighter children are in a daze for anywhere from half a minute to a quarter-hour. They do nothing well co-ordinated in that spell. The stupid specimens, if they lapse into chaos at all, whisk out of it fast.

Does this not suggest a simple amendment to Cannon's theory that emotions are highly adaptive organic responses? We may—and I believe we must—grant that they are highly adaptive, *but only as organic processes*. In short, they do serve the organs of the entire autonomic system. They also serve the blood well, and the muscles too, *in so far as the muscles are linked with the body below the cortical level*. But there their utility ends. They become hos-

tile to the individual as a thinking, planning, anticipative being. *They are the enemies of the cortex, and largely because the cortex is in a curious sense the adversary of the organs.* I do not say it is the enemy of the organism as a whole. I say only that *it is trying to deliver man from the necessity which thwarts freedom,* namely, the necessity of the reflex and the segmental acts that make up the bulk of animal life.

If emotional explosions do not pervade your entire conduct, they may stimulate you favorably. When checked quickly at the higher levels, they become an aid to achievement. Let me put myself on the witness stand.

Trivial rages tone me up absurdly. I owe much to them. Last spring I had a series of debilitating colds accompanied with an annoying bronchial tightness which caused me to cough at all hours. My nasal passages were completely clogged. One evening I could no longer breathe through the nose. Mouth breathing seemed to start the bronchial cough. So there was nothing to do but treat the nostrils with a certain brand of ephedrine which had worked best with me. So I sent a messenger to the nearest drug store for a bottle of it.

The messenger soon returned with a package. I opened it, only to find a strange preparation the name of whose maker I had never heard.

"Why didn't you get the kind I ordered?" I demanded.

"The druggist said this was just as good."

Now, one of my pet aversions is the retailer who palms off something "just as good" on me, when I ask for a nationally known brand. It is a petty fraud, nothing less.

I seized the bottle and started for the drug store myself, mad all over. And now notice, please! *Before I had taken twenty steps*, my nasal passages cleared for the first time in two or three days. My entire tone was high and pleasant. Within another minute or two my energies had risen in an overwhelming high tide. After a quarter-hour, I was almost at peak; and, had it been desirable, I could have worked hard all evening at anything.

This wonder was wrought by perhaps one ten-thousandth of a drop of adrenin, with a microscopic dash of other endocrine secretions! Hundreds of times I have had similar experiences. When delivering a public lecture, followed by open discussion, it often happens that somebody in the audience asks a question which, to my own way of thinking, connotes either stupidity or meanness; whereupon the little adrenal kick ensues, and I am toned up for endless hours of debate, with never a trace of fatigue. So too in writing. If I read something in the newspaper which vexes me, I can sit down and write reams and reams of discourse on the subject. Years ago I used to do this merely as a method of blowing off steam; and I think

I turned the unwanted energy to good account. For at least I used it in practice. And practice is fully as useful as performance.

When, however, the rage reaction is more intense—as it usually is when the provocation becomes serious—no such fortunate uplift takes place. An inconceivably slight excess of adrenin changes the larger chemisms profoundly. Now it paralyzes action, again it sets up ill organized muscle play, again it induces mild nausea and insomnia. To beat down such harmful effects, the safest rule is to relax as completely as possible. After a severe shock, though, you may have to keep still for hours, in order to neutralize the poisons.

All this suggests two distinct procedures for conserving energies under endocrine stimulation. You must be your own guide and judge in finding the level of energy discharge at which it pays to use your energy in some useful activity as promptly as possible. Here again you see the value of my other rule about always having on hand several interesting projects to which you may turn. It is a pity to boil over at a time and place where there is nothing to cook.

Make ready, then, for unexpected periods of high activity by having at hand a number of things to be done. Emulate the good engineer, who designs a steam plant so that all waste vapor or excess is shunted into some supplementary machinery, where it either drives wheels at low pressure or heats the factory or

is used in some chemical process. Such procedure is manifestly wiser than the old rule of counting ten when angry. Not that this latter has no uses; it has, as I show elsewhere. But merely checking a rising tide of rage seldom neutralizes the effects of the rage already generated. Our present problem is to turn the fresh energy to account. While making it serve you, turn off the valve by counting ten. But get the last ounce of power out of the energy already released.

#### CURRENTS

In this tiny guide book I do not wish to embroil the reader in scientific controversies. But there is one great issue bearing on the source, form, and direction of energy flow; and our rules may be confused unless we show where we stand in this matter. I refer to the sharply opposed theories as to the source of driving energy in man.

The great physiologists hold that the environment drives the brain, and the brain drives the organs of the body. Thus Sherrington, Crile and many others. The outstanding psychoanalysts hold that the organs run the brain. Thus Kempf most unequivocally and Freud, Adler, and Jung by clear implication. I reject both views as adequate, but I accept both as partial explanations. In other words, many persons have brains that are run by the environment, while many others have brains that are



run by their organs; then, too, some unfortunates have brains that run their organs just enough to cause early disaster, even death, usually through some worry or introspection. The physiologists come to their conclusion chiefly because they observe normal people. The psychoanalysts reach their hypothesis simply because they never see normal people but only neurotics and the insane. The normal man is essentially one whose brain is run by his environment. Neurotics and certain of the insane have organs that run their brains. Indeed, I incline to the view that we have come here upon the primary difference between normal and deviate man.

This is not so simple as it sounds. Varying enormously from part to part in its receptivities as well as in its channels of discharge into organs and muscles, the brain is run by the environment or by the organs in a rich variety of patterns. Probably we have something close to a normal frequency distribution here, as in so many other fields of mental activity. That is, the normal man shows thousands of patterns of environmental control. If his eyesight is poor, the environment controls his brain but feebly; if he has keen ears, he is controlled powerfully by that part of the environment which sets up air waves in the middle ranges of frequency. And so on. By the same token, the abnormal man is likewise controlled by his organs, not in any such simple fashion as Freud, Adler and

Jung fancy, but in the richest imaginable variety. How else could this be, once we realize that the thirteen or fourteen known secretions of the endocrines may combine in tens of thousands of chemical combinations, each having its own unique potency? Individual differences in sexuality are tremendous and seemingly continuous statistically.

There are reasons, furthermore, for believing that all sorts of mixed control types occur, such as the man whose brain is partly run by his environment and partly run by his organs. A highly extraverted neurotic might here qualify as a specimen. It is reasonable to conjecture that tens of thousands of such mixed control types could be assembled in any large city.

#### *Sexual Energy: Utilizing the Surplus*

In most normal people, sex energies are easily controlled by hard, pleasant work and vigorous exercise and play. In a certain number of otherwise normal people, they are not; but such persons offer a problem much too difficult to be discussed here. They should seek competent medical advice. Especially, too, should the highly introverted neurotics, to whom sex seems everything.

The neurotic, whose brain is driven by his organs, wastes immense funds of energy brooding over all sorts of organic cravings, especially the sexual. Both the literature and the psychology of sex have been written either

by neurotics themselves or else by scientists and physicians specializing in the handling of neuroses. Ordinary healthy people pay surprisingly little attention to the erotic issues. They react to the cravings pretty much as to hunger and thirst; that is to say, they either satisfy them, if this is feasible, or else they forget them as long as possible.

Now, hunger and thirst cannot be put out of mind and thereby solved, so to speak. But usually sexual cravings can be. The control that can be—and often is—exercised over love life merely by making resolves and then setting one's conduct accordingly is exceedingly great. Greatest, of course, in people whose brains are run by their environments: least in those who are dominated by their organs.

It seems that neurotics may be gravely disturbed by any blocking of sexual impulses. In extreme cases, such as those reported by psychoanalysts, all mental processes appear to be poisoned, as if by some pernicious inner secretion. (By the way, I wish some competent laboratory staff would make a series of blood transfusions from neurotics to non-neurotics, with a view to discovering whether the mental symptoms of a neurosis may not be induced. It seems reasonable to suppose that a neurosis may often [if not always] be an obscure endocrine autointoxication carried by the blood stream.) If the neurosis is a functional disturbance originating in secretions carried by the blood stream,

we cannot advise the neurotic to reform his conduct and keep his mind on external affairs until after we have cured him of the inner poisons.

And now for the normal person. What technique shall we suggest for the utilizing of waste or surplus endocrine energy of the sexual type? Our first rule is negative but emphatic and of almost universal application.

*Never try to use up such energy in intellectual work unless there is associated with it a great deal of gross muscular activity.*

Why not? For a simple reason! Mental work<sup>2</sup> burns up too little energy. As an engineer might put it, you might as well strive to empty a great reservoir of city water through a pinhole as to consume erotic energies adequately by reading serious books or studying German. A thousand days of reflection and memorizing would hardly use up one second's release of erotic energy in the blood stream.

In fact, study of any sort during such a physiological condition only makes matters worse. Little or nothing is learned during the vain struggle; so a sense of defeat is likely to take shape and contribute to an eventual inferiority complex. Much of the manifest incompetence of young men and women during high school and college years can be traced to the absurd amount of book work and grubbing and general sitting around and intensive loafing required by the curriculum manufacturers, the

fraternities, and the Big Bum's Book of Good Breeding. College athletics having gone professional, the ordinary students have few chances and little incentive to get out and bestir their sluggish muscles. College society having gone upper-crust, our post-adolescent learners find too many chances and too powerful incentives to ogle the opposite sex, to dance, to sip tea, and to sit in grandstands, elegantly immobile and superbly useless.

Our second rule is positive but of less uniform applicability. It must be skillfully amended to fit individual cases.

*Pursue vigorous activities which, first of all, make much use of the heaviest muscles (in arms, legs, and back) and, in the second place, are individual rather than social in their setting and aims.*

As to the first feature, only these heavy muscles consume energy fast enough to prove useful here. As to the second feature, individual activities such as walking, horseback riding, rowing, and gymnastics are more likely to cut off at the source the erotic energies than are any activities in which other people share. All social contacts tend, directly or indirectly, to involve some phase of the love life; hence they act as stimulants to sex reactions and, as such, are bad here.

Western society, during the past half-century, has become dangerously over-socialized especially on the lower levels of herd life. (It

is imperfectly socialized at the top.) Everybody sees too much of everybody else. Hence a diffuse, continual erotic stimulation, which is reinforced by the movies, the theater, and the newspapers, all of which cater to the herd for profit's sweet sake. I suspect that thousands of people have been made mildly neurotic by this state of affairs. Could all such get away by themselves and, at the same time, do plain, hard physical work, they would regain their balance in a jiffy. I admit, however, that individual differences play a major role here. We cannot affirm the flat rule in one tenor for all people. Yet it does serve as a general guide pretty well.

### CONTROL

"Master of destiny!"

This title is bestowed upon the frontal lobe of the brain by Tilney, our greatest brain physiologist. And never was title more fitting.

In this small, baffling, matchless patch of protoplasm is centered the control over all the energies of the body. It starts things going. It stops them. It amends. It postpones. It lays motions on the table. It sketches a thousand designs and throws away all save one. Personality, achievement, character and happiness are all determined, in the first instance, by this super-switchboard.

It is not the fountain of energy. It is a set of controls. The vast reservoirs to be tapped

lie elsewhere; in the endocrine glands, in the organs, and in the muscles. The frontal lobe touches these off, as a spark ignites dynamite. It is hard to detonate dynamite with a match; more unstable matter must be interposed between flame and charge, such as mercury fulminate. The frontal lobe is the match. The endocrines are the mercury fulminate. Blood and brawn deliver the blast that rends rocks and ruins empires. Just as the energy released in the tip of a burning match is as nothing beside the dynamite explosion, so is the current flowing from the frontal lobe into the thyroid and adrenal glands tiny, when measured against the activities later induced by the explosion of endocrines.

You form the simplest trustworthy picture of the tapping of inner energies, if you imagine a sequence of perhaps hundreds of matches, fuses, caps, and sticks of dynamite ranging in size from one ten-thousandth of a needle point up to the mass of a full-grown man. Microscopic match ignites microscopic fuse which burns up to and explodes microscopic cap, which detonates microscopic dynamite; then this last discharge serves as a match to a larger but still microscopic fuse, which in turn sets off a fuse of its same general magnitude, which explodes a quantity of dynamite, which in turn acts merely as a match setting fire to a higher order of fuse, and so on and on and on up to the final and complete act of a human being.

Herrick \* describes the cortical control thus:

"In times of stress a man will outlast a horse, and an educated man may outwork an uncultured man of much more powerful physique because the cortical reserves are available to drive jaded muscles on to intense effort long after fatigue has exhausted the normal capacities of the subcortical apparatus. A part of this superiority lies in the intelligent conservation of effort in the earlier stages of a long program of severe labor and other expressions of the reserves of associational patterns. . . . But a part of this superior efficiency apparently results from direct activation by the cortex, which acts like a spur to an exhausted horse."

Hardly twenty-four hours after pounding out the foregoing words on my typewriter, the energy of the brain was beautifully described in the latest announcements of Dr. George W. Crile. "The dynamics of the brain," says Crile, "seem to parallel the dynamics of the energy processes of non-living mechanisms—such as the internal combustion engine or an electric storage battery."

The most significant points in Crile's hypothesis are these:

The power system of the brain contains billions of individual dynamos or brain cells. These are the gray matter. The cells generate energy and distribute it in a system vastly more elaborate and greater than any communica-

\* "The Brains of Rats and Men." C. Judson Herrick.



tion system known to man. Each cell has a positive and negative charge. Electric potential and oxidation are interdependent. Neither can occur alone. Brain activity, furthermore, varies with temperature, electric conductivity, electric capacity and electric potential—just as external electric activity does.

The current generated in the gray matter passes through billions of infinitely complex conductance paths. Here every single human experience from birth to death is recorded.

So you see why it is that, as Crile puts it, "the word 'mind' connotes the work of the protoplasm of the brain. It would be more simple to make no use of such terms as mind and psychic, and instead use the physical terms that are involved. Whether a plant, a protozoan, or a man, the protoplasm in all its forms is influenced in the same way by anesthetics, by narcotics, by want of oxygen, by electrolytes, by poisons, and by variations in temperature. If the plant, the protozoan, the child, is sick, all of its protoplasm is sick. 'A sound mind in a sound body' should read: 'Sound protoplasm in sound protoplasm.' "