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RECURRING EVENTS OF NATURE DECLARED BRAIN OF GOD

Events of Nature, recurring in logical order, are thoughts, idea or moments in the brain of God. Such is the sweeping hypothesis formulated by Prof. Raymond Dodge, of the Institute of Psychology at Yale University.

The embryo recapitulating the history of its race represents a conscious moment in some supra-individual mind. The nebulae that start out as gigantic clouds of gas and become great stellar systems, like our own, are ideas in the brain of some spirit of space. The periodic rise and fall of empires and races, the lives of men, the revolution of the earth around the sun, all of these phenomena are thoughts of God.

Skeptics of religion sometimes demand to be shown the brain of God. Prof. Dodge has produced an answer using the analogy of the psychological and physiological workings of the human brain. It may be that the hypothesis that he has formed will rank with the major formulations of all science.

In the following article Professor Dodge explains the scientific basis for his hypothesis and gives in detail the method of reasoning that he uses in formulating his novel idea which blends the latest facts of science with the aspirations and ideals of religion.

WHERE IS THE BRAIN OF GOD?

By Prof. Raymond Dodge,
Institute of Psychology, Yale University.

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Not infrequently a person is brought to a neurological clinic with a strange disturbance of speech. He has suddenly developed an inability to read and to understand hitherto familiar phrases. If the patient is right-handed and his hearing of noises is unimpaired, the brain surgeon will proceed with great confidence on the assumption that there is a neural disturbance on the left side of the brain at about the level of the temple. This disturbance of speech is a common one and is called sensory aphasia. If a patient has become suddenly unable to see objects in the left half of his field of vision, the brain surgeon would assume with confidence that the

cause of his left sided blindness is a disturbance of the right side of the brain at the back between the halves. The life and usefulness of human beings is daily conserved by brain operations based on the general assumption that certain definite disturbances of conduct and thought are connected with disturbances of definite brain areas. The assumption is in accord with scientifically known facts. It is justified by practical experience.

It is unfortunately true, however, that the exact nerve processes which are involved in some of the simplest mental acts are still unknown. The neurology of discriminating red from green, hot from cold, or sweet from bitter is just as obscure as the neurology of remembering yesterday's dictation, the shift of attention from business to golf, and the control of conduct by the intention to be honest. All efforts to picture these mental processes are mere hypotheses, scientific guesses, aimed to arouse investigation rather than self-satisfied belief. Notwithstanding the limitations of our information, no one who is acquainted with the scientific evidence doubts that some kind of brain action is a correlate of all our mental life.

Not all the consequences of the confident assumption of the dependence of mind on brain are as salutary and helpful as the practice of brain surgery and psycho-physiological research. On the contrary some logical conclusions from the premises seem quite alarming, since they are opposed to one of the most fundamental articles of our social faith. One of these more or less alarming conclusions proceeds as follows: If all mental action is conditioned by brain action, then either there is no mental life after death or it must be of some other order than our present. Furthermore, with such a premise, the possibility of believing in a suprahuman mind seems out of the question.

The Answer of Fundamentalism

Motivated entirely by the desire to be honest with himself and to think straight, a scientifically minded person might very well say to his brother who still clings more or less blindly to conventional belief, "Show me the brain of your God. Unless I can find his nerve cells or the tissues that include them, unless I can put my finger on his nervous system, common honesty prevents my believing in a suprahuman mind." Several courses are open to the believer. He may say to his scientific brother, "Have faith and let nothing interfere with it. Forswear all impious scientific evidence and believe as I do or as I try to." That is the essence of Fundamentalism. It threatens a return to propaganda by force, though at present its modes of torture are limited to social ostracism and economic disability. There are good psychological grounds for the belief that propaganda by force can never prevail. Now, as of yore, true souls will not hesitate to suffer for the sake of intellectual integrity. The moral daring of the martyrs is not dead.

The Double Truth

Another course for the believer and his scientifically minded brother might be to follow the example of the mediaeval compromises and adopt the principle of the double truth. That is to say, they might adopt the principle that one is free to believe in religion what is doubtful in science. Now there is excellent philosophical precedent for the expedient of leaving to the practical reason what is unknowable. Something similar is very commonly done when the religionist points out to the scientist the minute cosmic area that his science covers and with a sweep of the arm to indicate the indefinite unknown solemnly proclaims, "There, is God!" Personally, I think the gesture is an impiety. I could have but scant regard for a god who inhabited only the unknown. Moreover,

with the gradual encroachment of the known on the unknown, a god of the unknown would be pushed further and further into the outer darkness, out of contact with practical life. Some thoughtful people believe that this is what is happening as science develops. It is the great excuse for Fundamentalism. To stand by and see God gradually crowded off the sidewalk by a parvenu is not edifying for any normal person. It naturally arouses all the finest loyalty of the believer and makes him fighting mad.

The Scientific Attitude

It is possible that in addition to these two unhappy sequels there is a third ending to the story that is less repugnant to our sentiments. Suppose for example the believer requests his brother to look deeper into the too familiar facts rather than away from them. It is a good maxim in practical life that the cure for darkness is not less light but more. It is an equally good scientific maxim that the best scientific investigation opens the doors for further and still more profitable research. True science never sets a limit to its progress. Now our believing brother might ask several pertinent neuropsychological questions whose consideration is illuminating, even if definite answers are not yet available. He might ask, for example, just where in the chain of neural occurrences does consciousness arise. When a patient answers the request to give his name, we can trace the course of the nervous impulse with considerable assurance from the inner ear, through the ganglia at the base of the brain, to the appropriate projection area of the left hemisphere, which was disturbed in the case of the first patient mentioned.

If we ask at the various levels whether consciousness resides there, we shall make the somewhat disconcerting discovery that consciousness resides nowhere. It can hardly be in the ear, for if the ear is isolated there is no awareness of sounds. For a similar reason it is not in the big eighth nerve or in the corpora quadrigemina or even in the relevant temporal convolution. Each of these structures is essential, but each may be intact and functioning normally without awareness of sounds if it is isolated from the rest of the nervous system. Something occurs in each link of this chain of neural events that is much like what occurred in the preceding one. In no link is consciousness found, yet something happens in the final one that is capable of being included in that form of integration which we call consciousness and in the relatively more permanent and more inclusive integration which we call mind. There is no necessity for this inclusion. It is more or less completely absent in sleep and under the influence of such narcotics as chloroform or ether.

A second question that might be suggested is not unrelated to the previous one. Are mental processes correlated with specific kinds of matter or with specific kinds of organization of matter? If with the former then, since there is no element exclusively in brain, the same matter outside the brain should guarantee existence of extra-organic minds. There is, however, no evidence anywhere that consciousness is dependent on a given kind of stuff, but rather on its peculiar organization. If mental processes are correlated with the specific kinds of organization of matter then it is a privilege and a scientific duty to inquire what are the characteristics of that particular kind of unity and whether it occurs only in the cerebrum.

This kind of questioning is getting us ahead a bit even when it uncovers our ignorance, so let us advise our believing brother to press his inquiry and ask what kind of integration it is that is mental. On this we have scant relevant data.

Characteristics of Mental Integration

We know many kinds of integration which give no indication of being conscious. Some of them occur in the nervous system. Of these the reflexes would be an example. We also know some of the characteristics of that kind of integration which is conscious. We can be reasonably sure that it is dynamic rather than static. By this we mean to say it progresses and has direction. It is like a chemical reaction rather than like an arch. One might be tempted to say that this dynamic integration is vital, but the one differentiating characteristic of vital chemistry is the reversibility of its self-regulated metabolism. That is to say, vital metabolism rebuilds what it breaks down. There is no known characteristic of mind that necessitates its exclusive correlation with reversible metabolism. On the contrary the only known neural reactions to external stimulation are dissociative.

Two further characteristics of mental integration that we know are first, that it is cumulative, like a rolling snowball, and, second, that it is recapitulative. That it is cumulative is shown in the summation of memory to which each moment adds something that was not there before. Leaving its predecessors more or less intact. There are many examples of cumulative integration in our universe. One of the big ones is our solar system, which is constantly picking up stray waifs on its way between the stars. But the rolling snowball integration is not the most characteristic factor of mind. It apparently is essential to mentality, but not a differential.

That mental integration is also recapitulative is shown in the character of personal experience. Out of each present experience I not only get a new memory factor that builds itself on to a past, but the new stimuli revive that past more or less completely. It is I with all my past experience who hears the noises in the adjoining room. It is I that adds them to my memory treasury and in that process I recapitulate the sum total of my past. These are the only characteristics of mental integration that seem fairly well authenticated. Mental processes are characterized by associative memory and apperception.

Synthetic Minds

Suppose we had the engineering problem of planning a mental organism along these lines. The first task would be to plan for a few differentially reacting mechanisms. The primary ones we would call sense organs. The exact number and kinds of sensory reactions might be variable as they are in humans. The precise energy changes to which they might react are theoretically quite immaterial. The second task would be to integrate these primary reactions into a unit that preserves each new reaction by uniting it with the old in such a way that in each moment of total reaction the old is recapitulated. Now, if we had such a group of summative recapitulating reactions, however bizarre the materials might be, should we not have something so closely resembling remembering personality as to be indistinguishable from it? If in addition we could add that strange projection of the past reaction into the future, which we call intent or purpose, our synthetic personality would take on spiritual significance.

If we think of consciousness, mind, and personality in this manner as a kind of integration whose observable aspect is behavior, these concepts cease to be a matter of indifference in any scientific Psychology. They represent its ultimate problems.

The purport of our questioning is not obscure. If we refuse to allow ourselves to be quite satisfied with the crude doctrine that mental processes correlate with brain action and insist on asking with what kind of action in the brain mental events actually do correlate, we follow a strictly scientific procedure that is not without its practical utility. Apparently the answer must be that not the brain but some form of integration that may go on there is the correlate of mental processes.

The Great Hypothesis

There is now opportunity for one more related question. Is there any evidence that elsewhere in the universe there are conditions for a similar form of integration of any factors whatsoever?

Dynamic cumulative integration is a common phenomenon within the limits of our knowledge. Recapitulation is certainly rarer. It apparently recurs in the development of the embryo and possibly in some astronomical events. The hypothesis is not entirely fantastic that each embryo as it grows and develops, recapitulating the history of its race, represents a conscious moment in some supra-individual mind; and that each developing nebula represents an idea in some spirit of the universe.

Further than this we may not go with our present scientific knowledge. One may say it is all nothing but a more or less plausible hypothesis. But the way is apparently open for conscientious faith to say, "I will so conduct myself as though the great hypothesis is true." This provides a place for its pragmatic sanction. Scientific investigation cannot be said to have developed a practical working faith. It probably never will. Its business is the simple investigation of phenomena. But it certainly does prescribe a place for a practical working faith. The only disaster to faith and science would be the assumption that our present scientific information was complete and that further investigation was unnecessary.

MEASURING ACHIEVEMENT BY ABILITY

By Dr. Edwin E. Slosson

School teachers are at last beginning to see a way to remedy what has been hitherto regarded as an inevitable defect of the educational process, the appalling waste of the most valuable material in the world, the time, the efforts and the hopes of youth. Year after year as the teacher met the fresh faces in his college classroom he has been saddened by the thought that of these students, perhaps brought there by high ambition, perhaps sent there at parental sacrifice, a certain proportion must fail despite what all that they or he could do. They had all passed the entrance examination and possessed the minimum requirement of knowledge, yet neither he nor they could tell whether they were qualified for the tasks that would be imposed upon them in the next four years, or whether both would lose their labor.

Now, however, it is possible for a high school senior to find out with a very high degree of probability what will be his success in college studies. The new examinations devised for this purpose are objective, comprehensive, fair and impersonal, and they test both the factors of success, training and aptitude. In one state over 1500 students have now been followed through their third year at college, and their achievements, in most cases, come close to the predictions

based upon these qualifying examinations.

Prof. Carl E. Seashore of the University of Iowa in his address before the National Academy of Sciences on the discovery and motivation of the gifted student called attention to the amazing magnitude and fixity of individual differences as disclosed by mental measurements. For example, one student may have ten or twenty times as good a memory for the shapes of things as another student has. Or the same person may have ten or twenty times as good a memory for such geometrical forms as he has for differences in the quality of musical tones. The accurate knowledge of such different aptitudes is of inestimable value in determining whether a boy or girl should undertake training to be an artist or a musician. Such knowledge can be obtained at a surprisingly early age and it is surprisingly persistent. As Professor Seashore says:

"The sense of pitch and the sense of rhythm, for example, may be measured early in childhood and are found to remain constant throughout life except for deterioration, normal or pathological, despite most elaborate education and special training. A boy who is quick and accurate is likely to be the man who is quick and accurate in any particular type of motor process. As our measures of intelligence are gradually improved, we find more and more evidence that the intelligence quotient of 75, 100, or 125 tends to remain fairly fixed throughout life, with or without extensive education of the individual."

On account of the infinite variety of individuals and the wide range of their capacity, it is manifestly unfair to require of them all the same amount of work or the same grades. It has been found that for an examination, which the upper quarter of the class should pass with a grade of 75 per cent, the passing grade of the poorest members of the class, if they made equal effort, should be set at 25 per cent. To set the same requirement for such unequal abilities in the classroom is as unfair to both extremes as it would be in the gymnasium to require them all to jump over a three-foot bar, which for some would be impossible and for others it would be child's play. The new educational slogan, according to Professor Seashore is "to keep each of the students busy at his highest natural level of successful achievement."

The present practice of whittling down square pegs to fit into round holes may intine be abolished by means of placement tests and vocational guidance. It is coming to be realized that all young Americans are entitled not only to the opportunity for education but to the particular kind of education to which they individually are fitted for. The old Socialist motto: "From each according to his ability; to each according to his needs", is the motto of the new education.

Children are taught geography in a school which overlooks the harbor in Southampton, England, by following the courses of great ocean liners which can be seen leaving port with miniature vessels on a large map painted on the roof.

Three and a half million one-half cent stamps were recently shipped to western cities by airplane.

NEW EXPERIMENTS MEAN DOWNFALL OF RELATIVITY

By Dr. Ludwik Silberstein
Author of "The Theory of Relativity".

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Evidence against the validity of the relativity theory was unfolded before the meeting of the National Academy of Sciences by Prof. Dayton C. Miller, of the Case School of Applied Science, who, by a much refined and improved repetition of the so-called Michelson-Morley experiment, has shown that there is a definite and measurable motion of the earth through the ether.

Professor Miller has obtained on four occasions a small positive effect at Cleveland, namely, the equivalent of a velocity of about 2 kilometers per second at the altitude of the Case School of Applied Science, and about 3 kilometers per second on the level of the neighboring hills. Whereas at the altitude of the Mount Wilson Observatory in four consecutive experiments spread out over four years he obtained with increasing precision a positive result of 10 kilometers per second, his last result this April justifying him in asserting that the result is correct to within one-half kilometer per second.

The technical details of these experiments themselves will be described shortly in special papers by Professor Miller. The purpose of the present note is to say a few words about the implications of these results as viewed from the standpoint of the relativity and the ether theories.

In the first glance then this definite result is entirely antagonistic to the Einstein relativity theory, which in fact could not be adapted to these results of Professor Miller by any conceivable modifications, unless the very fundamental principles of Einstein's theory were given up. This, however, is as much as to say that Professor Miller's results knock out the relativity theory radically.

In the second place, from the point of view of an ether theory, this set of results, as well as all others previously discovered, are easily explicable by means of the Stokes ether concept, as modified by Planck and Lorentz.

Without entering into the mathematical details associated with this statement we may say only that Professor Miller's results as obtained in Cleveland and Mount Wilson, are given immediately by the main property of such an ether, namely, to adhere almost completely to the surface of the earth, and therefore share almost entirely its translational motion over its surface and to have a gradually increasing velocity relative to it when we go higher and higher up.

In the third place, the result of the recent rotational terrestrial experiment at Clearing, Ill., near Chicago, which gave a full effect associated with the spinning motion of the earth, can be accounted for by making the natural assumption that our globe, being almost perfectly spherical and having a purely gravitational grip upon the ether, does not appreciably drag it in its rotatory motion. Also the deflection of the light rays around the sun to the amount claimed by the Einstein formula can be easily accounted for by means of a compressible ether provided its dielectric constant is related to its density and pressure by a very simple formula published a few years ago in the Philosophical Magazine.

The amount of additional evidence for the reality of Professor Miller's results afforded by his tables showing the relations of the observed azimuths of drift to the sidereal time is very remarkable. These tables indicate a motion of the solar system in a direction and with a velocity in good accordance with the independent results obtained by Dr. Stromberg and others.

ENGLISH RELATIVIST UNCONVINCED THAT RELATIVITY IS OVERTHROWN

(Professor A. S. Eddington of Cambridge University, who introduced the Einstein theory to the public in 1919 by reporting its confirmation by his solar eclipse observations, was asked by Science Service for his opinion of the significance of the new evidence on the question presented to the National Academy of Sciences meeting at Washington. Prof. Dayton C. Miller of Cleveland reported that in repeating on Mount Wilson the original Michelson-Morley experiment, on which the relativity theory was founded he got results contradicting the theory. Prof. A. A. Michelson of Chicago reported new experiments favorable to Einstein. Dr. W. S. Adams of Mount Wilson finds a shift in the spectral lines from the faint companion of Sirius, as Einstein predicted.)

By Prof. A. S. Eddington,
(Copyright 1925, by Science Service)

"It is difficult to reconcile Miller's results of the earth's velocity with Michelson's latest experiment on the earth's rotation. I must await details of the experiment",

Adams has accomplished a striking new test of general relativity that demonstrates the usefulness of this theory as an aid to astronomical progress and confirms an astronomical hypothesis previously doubtful.

NATIONAL ACADEMY OF SCIENCES HONORS WOMAN ANATOMIST

The doors of the National Academy of Sciences, the most exclusive learned society in this country, have been opened to a woman. The recipient of this unique honor is Dr. Florence Rena Sabin, professor of histology at the Johns Hopkins Medical School, Baltimore. Miss Sabin's brilliant researches on the living cells in blood, in conjunction with a brilliant research career, won this distinction for her.

Eleven men distinguished in science in this country, and six foreigners, were also made members of the Academy. The new American members are: William D. Coolidge, of the General Electric Company, developer of the X-ray tube now in general use and of the process for making ductile tungsten employed in electric light filaments; Dr. R. A. Daly, of Harvard University, an authority on volcanoes and the structure of the earth; Dr. Edward M. East, a noted botanist of Harvard University; Dr. Charles A. Kraus, of Clark University, chemist; Dr. Solomon Lefschetz, of Kansas University, one of the foremost of American algebraists; Ralph Modjeski, Chicago engineer, who is constructing the great Delaware river bridge; Dr. W. B. Pillsbury, of the University of Michigan, author of a widely known text on psychology; Dr. F. A. Saunders, physicist at Harvard University; Dr. James P. Smith, of Stanford University, geologist; Elmer A. Sperry, of Brooklyn, inventor of many stabilizing devices based on the gyroscope and of the Sperry focusing search light; Dr. Harry G. Wells, director of the Sprague Research Laboratory of the University of Chicago.

The six foreigners elected represent four countries. They are Sir Charles Parsons, inventor of the steam turbine, and Arthur S. Eddington, noted astronomer and authority on relativity, both of England; Dr. Adolph Engler, a German botanist who is largely responsible for the scheme of plant classification now in universal use; Dr. Hans Spemann, a German zoologist, international authority on embryology; Charles F. E. Schneider, French engineer, inventor of the famous French 75 millimeter field-gun; and Dr. Neils Bohr, physicist at the University of Copenhagen, who propounded a theory of light emission that is one of the most talked of subjects in the world of science.

NEW DEVICE TO MAKE OCEAN SURVEY EASIER

Perfection of a new sounding device especially designed for the speedy mapping of the ocean floor by means of echoes from the sea bottom, was announced to the American Geophysical Union meeting by Dr. H. C. Hayes, U. S. Navy physicist and inventor of the sonic depth finder and other submarine signalling devices.

The new apparatus will be given a rigorous test on the U. S. S. "Dallas" within the next few weeks and is expected to displace the larger and more costly machines now in use.

The present sonic depthfinder was not designed for survey work, Dr. Hayes explained, but was originally designed during the war as a means of finding the range of an enemy ship by triangulation. The idea of sending a sound to the ocean floor and determining the distance to the bottom by the time it took to receive the echo was conceived when he was unable to get two ships for experimental purposes as at first planned.

The application of the range finder to survey work was so promising, that it was never used for the purpose for which it was built. The new depth finder is similar in operation to the old, but is much smaller and cheaper, as well as more accurate. It is especially designed for survey work.

Dr. George W. Littlehales of the Hydrographic Office of the Navy reported to the Union that surveys by means of the original sonic depth finder are now being made by the battle fleet operating in the Pacific. These surveys are made in the ordinary course of the voyage and in the last year remarkable results have been obtained in many parts of the world.

Dr. Littlehales told of the discovery of a hitherto unknown bank in the supposed deep China sea by a ship equipped with this device. Another bank was discovered by a ship traveling from Gibraltar to New York, while another vessel quickly demonstrated the non-existence of a bank reported in the Pacific off San Diego, Calif.

Capt. J. P. Ault, of the Carnegie Institution, announced plans for the resumption of the cruises of the non-magnetic ship "Carnegie" next year. These plans, he said, contemplated the equipping of the ship with depth finding apparatus and the making of detailed surveys of the bottom. The observations on the variations in the compass will also be carried on, but not so intensively as heretofore. Instead, great attention will be given to the variations in atmospheric electricity and their effect on the fading of radio signals and the differences in radio communication at night and in the daytime.

Dr. T. Wayland Vaughan, director of the Scripps Institution of the University of California, told of the results of research to discover the food value of sea water. Microscopic plants and the minute animals that live in them furnish the food for many fishes. The Scripps Institution is studying the numbers of these tiny creatures in a given volume of water and their relations to the fisheries and the variations in numbers according to temperature, saltiness, and other conditions of the sea water.

VOLCANOES LOCAL AFFAIRS; NOT CHIMNEYS OF INFERNO

Volcanoes are local affairs, comparatively small test-tubes for cosmic chemistry, and not outlets for a vast interior mass of liquid fire deep within the earth. The lava in their boiling lakes is hotter at the top than it is in its depths. And the heating-up process depends partly on oxygen extracted from stones that fall in from the surface.

These and other ideas counter to many old, orthodox notions about volcanoes were presented here at a discussion on volcanism at the meeting of the American Geophysical Union. Dr. T. A. Jagger, the scientist who chose the rim of the great Hawaiian volcano Kilauea as his dwelling place, led the discussion. Other participants were Drs. Arthur L. Day, F. E. Wright, E. S. Shepherd and R. B. Sosman of the Geophysical Laboratory of the Carnegie Institution of Washington, Dr. E. W. Brown of Yale, and Dr. W. M. Davis of Harvard.

Dr. Day told of the great volume of the rock masses concerned in the great eruption of Kilauea last year, when the old fire-pit in the mountain collapsed and formed a new opening fully ten times the volume of the old, into which something like seven billion cubic feet of rock and gravel disappeared. The shifting of the scene of steam emission, the rifle-like velocity with which great boulders were hurled out, and the fact that the lower parts of the crater were not nearly so hot as the older theories had indicated would be the case, led to the conclusion that volcanoes are fed not from one great central shaft but from a number of smaller, root-like lava channels.

Volcanoes are commonly thought of as growing mountains. Dr. Jagger declared that they really sink more than they rise. Kilauea, he said, rose during the period 1912 to 1920 but is sinking now. Seismographic instruments indicate also that the mountain tilts from side to side in relatively short periods. The lava in the crater has a fluctuating level, a grand explosive eruption being always preceded by a deep recession of the lava, which apparently allows surface water to enter the hot tube, generating vast quantities of steam.

Dr. Shepherd and Dr. Sosman offered explanations of some of the puzzling chemical phenomena of volcanoes. Apparently much of the heat that keeps lava liquid and supplies energy for the steam explosions comes from chemical combinations going on near the surface. Carbon monoxide, gaseous sulfur and hydrogen are among the gases present in lava. Present also are the results of the oxidation of these gases, that is, carbon dioxide, sulfur dioxide, and water vapor, giving evidence that chemical processes are going on all the time. The source of the oxygen presented a puzzle. It was pointed out, however, that the vast quantities of rock that slide into the crater during a collapse like that at Kilauea last year contain much oxygen combined with iron. The heat roasts out this oxygen, which can then recombine with the other elements.
