SCIENTIFIC PROGRESS

CHEMISTRY (Continued)

A factory for making power alcohol from farm crops was completed at Atchison, Kansas.

Doctor Bartow (Iowa University) developed hexanitroinositol, an explosive made from corn starch, (inosite).

"Organospheres", models of nonmetallic atoms, one hundred and seventy million times their actual size were developed by Dr. Steiger, of Swarthmore College for the study of molecular formations.

The lithium isotope (atomic weight six) was concentrated by Dr. Rumbaugh of the Franklin Institute. This solid, the lightest ever made has an atomic weight less than two times that of helium.

ENGINEERING

Dr. Zworykin, (of the Radio Corp. of America), demonstrated his invention, the infra-red ray that "sees" through haze, smoke clouds, etc.

Dr. Abbot of the Smithsonian Institute reported that his solar engine converts into energy 15% of the rays falling on its mirrors.

Polaroid, a type of glass which polarizes light was made commercially practicable.

The huge bridge between San Francisco and Oakland and the Triborough Bridge connecting parts of New York City were opened for traffic. Work on the Golden Gate bridge was in progress throughout the year.

GEOLOGY

Dr. Paul MacClinton and H. H. Hess of Princeton, advanced the theory that the canyons on the ocean floor might have been caused by a change in the speed of rotation of our planet.

Pre-Cambrian rocks, 600 million years old, have a great resistance to the passage of an electric current. Rocks of a lesser age have a lesser resistance according to R. H. Card of the American Telephone and Telegraph Company. Another method of estimating the age of rocks was advanced by Massachusetts Institute of Technology. He stated that the amount of helium in rocks is effective in determining their age.

MEDICINE

According to a Philadelphia scientist high blood pressure is natural in some individuals and lowering it is dangerous.

Two University of Chicago scientists reported that blood is not produced in the marrow of the bones of the hands and feet. Their lower temperature prevents blood formation.

The human mouth grows wider and the nose both wider and longer as age increases according to Dr. Hrdlicka. Further, he indicated that the width varied with the climate of the geographical habitat of the individual.

PALEONTOLOGY

Dr. Barnum Brown, of the American Museum of Natural History, reported a marine fossil area in Western United States of almost 600 square miles.

Rev. Dr. Reynolds of St. Louis University, led an expedition in New Mexico which discovered many skeleton fragments, among which was that of a rat-like animal, some 60 million years old, believed to be unknown to science.

PHYSICS

Ballons carrying self-recording instruments ascended to a height of almost 17.5 miles. They took valuable observations of cosmic rays.

The arrangement of atoms in glass, a non-crystalline substance was determined by the use of X-Rays at the Massachusetts Institute of Technology.

Tremendous steps were taken during the year 1936 in the investigation of cosmic rays.

MASTODON TUSK

(Continued from page 10)

where and the tusk was carried by strong currents to the area where it was discovered.

Professor Cable, while in New York recently, discussed the tusk with Dr. Walter Granger, head of the department of vertebrate palentology of the American Museum, who declared that the tusk was priceless and is evidently the largest on record. The American Museum possesses a similar tusk nine feet six inches long.

The Scientific Press

—A Bulletin of the Latest Scientific News—

Volume 1 MARCH, 1937 Number 3

THE NEW VORTEX MECHANICS

CARL F. KRAFFT

MODERN physics attempts to explain the properties of matter on the basis of energy relationships between protons, electrons, and neutrons, but we are left in the dark as to what these particles consist of. Even Schrodinger's wave mechanics does not explain why there are two kinds of electricty, or what the neutron is made of. Wave mechanics is peculiarly unsuitable for this purpose, for although waves are dynamically self-sustaining, they are not localized in space like the elementary particles of matter.

Besides wave motion, there is only one other form of motion which is dynamically self-sustaining, namely vortex motion, and here we do have localization in space. The 19th century physicists assumed that the elementary particles of matter are vortices in the ether, but they made the gratuitous assumption that adjacent vortex filaments exert no effect upon one another. They furthermore assumed that these vortex filaments could be knotted or interlinked with each other so as to form the atoms of the various chemical elements. This, however, failed to account for the two kinds of electricity, so that the classical vortex theory was hastily discarded.

In 1906 Dr. Hermann Fricke of Berlin laid the foundation for a new system of vortex mechanics. Instead of assuming, as Maxwell did, that the ether was a frictionless fluid, Fricke assumed that it did possess a property analogous to friction, by virtue of which its direction of flow, although not its energy, was affected. Further development of these ideas was temporarily suspended by the war, but in 1921 Fricke again presented his ideas in Germany, and was soon followed by O. Wiener and others. Fricke concerned himself mainly with astrophysical applications of his new theory, without attempting to work out in detail the structures of the atoms. The latter problem was undertaken by the writer several years later.

Proceeding on the assumption that the ether possesses a property analogous to friction, the writer concluded that adjacent vortex filaments can never rub each other in transverse or opposite directions. This immediately rules out any possibility of knotted or interlinked vortex filaments, and leaves for consideration only circular vortex rings. Furthermore these cannot be piled on top of one another indiscriminately like coins in a bag, but only in such a way that there will be true rolling contact between adjacent filaments. Only two arrangements are geometrically possible, namely with the flux in adjacent surfaces directed either inwardly, or outwardly, but not in opposite directions. This immediately suggests protons and electrons.

Although two vortex rings can be brought together in either of two different ways, there is only one way in which three rings can be brought together, for if the first and second form an electron, then the second and third form a proton, or **vice versa.** This explains on the basis of pure geometry why there are two kinds of electricity, but only one neutron.

(To be continued.)

SCIENCE FACTS



The union of two SOUNDS, under the proper conditions, will produce silence.

In reality the flow of electrons that we call an electric current is from minus to plus rather than from plus to minus.

White light is a mixture of all colors of the spectrum.

The longest light wave to which the human eye is sensitive is red and the shortest is violet.

Sunspots are increasing. By comparing past historical records with astronomical records it has been reported that there is a general tendency towards war during a period of maximum sun spots.

The nearest star is ¼ of a million times as far from us as is the sun.

The earth receives from the sun, continually, 230 million million horsepower.

There is a south magnetic pole at the north geographic pole and a north magnetic pole at the south geographic pole.

Speech sounds were first transmitted electrically in 1875.

The Hammond electric organ will produce 253 million tone combinations.

Light affects the germination of seeds. The long wave end of the spectrum is more beneficial to seed growth than is the short wave end.

The speed of light (according to the Michelson's experiments) is 299,774 kilometers per second. Even at this speed light that we see from some of the fainter stars started out centuries ago.

A new estimate on the age of the earth was advanced some time ago by Dr. Adams of Carnegie Institute. Dr. Adams believes the earth to be at least three billion years old. Its temperature was, then, probably over 5,000 degrees F.

[illegible]

PROFESSOR WISE SAYS:



Here are some formulas that are used continuously in mathematical work of a physical nature. They are concerned with elementary physics; and, every one should be familiar with them:

D=M/V (density of a substance equals its mass over its volume).

F=HAD (In computing the force with which a body is buoyed up in a fluid the equation, force = depth (h) times density times area).

P=F/A (Pressure is equal to the force per unit of area).

$P_1V_1=P_2V_2$ (This is Boyles law, pressure at constant temperature is inversely proportional to volume).

v=at (velocity of a body is found by multiplying the acceleration and the time).

I=E/R (This is Ohm's law, the intensity of a current equals the number of volts or the electromotive force divided by the number of ohms or the resistance).

E×I=W (The volts times the amperes will give the number of watts).

v=nl (In sound, the velocity is equal to the number of vibrations times the length of one wave).

E=o/i (The efficiency of a machine is equal to the output divided by the input).

M=R/E (The mechanical advantage of a machine may be found by dividing the resistance by the effort).

THOMAS ALVA EDISON

(Continued from page 17)

moving picture camera. During the summer of 1889 the first motion pictures were taken. The kinetophone, which he called the talking motion picture, was introduced in 1912.

During the war, at the request of Secretary Daniels of the Naval Department, Edison became advisor of the Naval Consulting Board. It was the duty of this board to pass ideas and suggestions to the Navy Department. Edison invented the listening machine for detecting submarines.

Edison always had lots to do, but he always liked doing it. His death on October 18, 1931 caused world-wide mourning. His fame as an inventor can never die.

(Editor's Note: The illustration used in this article was furnished by the Ediphone Company, Inc.)

The English physicist, Cavendish, in 1781, prepared water by exploding a mixture of oxygen and hydrogen.

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HIGH SCHOOL CONTEST

Here are the answers to the problems in the March issue of the Scientific Press, page two:

1. A ton of wood is heavier than a ton of iron.
2. Madame Curie.
3. Thomas A. Edison.
4. The work on the 200-inch telescope.
5. Drs. Anderson and Hess.

Detailed explanations will be furnished upon request.

Dr. Morse of Princeton and Dr. Kassner of Columbia advanced a new mathematical tool based on the "trihorn". The trihorn is formed when three curved lines pass through a common point in a common direction. How to measure the horn angle was a problem even in the days of Euclid. The "new geometry" has been called by Dr. Kassner, "trihornometry".

To the worker with limited equipment arc spectra is very helpful in spectrum analysis. A simple arc lamp may be used with a bit of the substance to be examined in the cavity of one of the carbons. By reflecting the light into the split of a spectroscope an intense bright line spectrum is formed.

The nuclei of certain heavy atoms disintegrate. This process is known

SCIENCE NOTES

The ultraviolet ray is useful in determining the ages of eggs.

Because time is a fundamental concept of our existance it is almost impossible to define it. If you don't think so, stop right now and work out your own definition of TIME.

Some of the stars in space are of a great density. It has been estimated that there are stars of such density in the universe that a tablespoon full of the matter composing these stars would weigh many hundreds of pounds.

The new Army Air Corps observation balloon, type C-3, which is being constructed at Fort Still, Oklahoma, is being made of **synthetic rubber**, probably the first time that this has ever been done.

It is believed that our race is steadily growing taller.

Some day orchestras may play on transparent instruments. A violin has been constructed from a clear type of synthetic resin. The violin possesses excellent tone. Flutes have similarly been made.

In the MAY Issue!

THE NEW VORTEX MECHANICS—By Carl F. Krafft. In this article the new vortex atom will be described, a diagram of the neutron and the hydrogen atom will be explained, some interesting material on ether will be presented, and the mechanism of electrostatic action will be revealed.....Mr. Krafft offers the vortex theory of the atom in **place of the nuclear theory** which is decidedly fallacious on a number of points, (despite its ratification by high authorities).

ALSO an account of the recent meeting of the American Physical Society, and the American Geophysical Society.

SUGAR VS ALCOHOL

Yale Doctors Experiment with Rats

By experimenting with rats two Yale Doctors, H. W. Haggard and L. A. Greenberg, found that by increasing the amount of sugar in the blood stream alcohol can be burned out of the body.

The process of getting drunk is due to the concentration of alcohol in the supply of blood going to the brain. When there was .1% sugar in the blood it took ten milligrams of alcohol per each cubic centimeter of blood to kill a rat. When the sugar concentration was doubled it took twelve milligrams to prove fatal. When the amount of sugar in the blood was reduced to a slight trace, seven milligrams were sufficient to kill. The protective ability of the sugar was limited however.

These experiments tend to prove that the sugar in the blood acts as fuel in a furnace. The sugar burns up the alcohol so that it cannot reach the brain.

Intoxication produced by types of poisons other than grain alcohol, for example methyl alcohol or ether, which pass out of the body in the same manner in which they enter, is not halted by the presence of sugar in the blood.

The results of these experiments evidently hold true with human beings, since by observation, it has been found that a diabetic, in whose blood there is a surplus of sugar, does not get drunk very easily.

HEAVY WATER

Elixir of Life?

In a 15 minute report titled "Sympathomimetic Influence of Deutrium Oxide", Dr. H. G. Barbour, of the Yale Medical School, flatly contradicted the precaution made a few weeks ago by Dr. Kendall of the Chemistry Department of the University of Edinburgh, regarding the effect of heavy water (deuterium oxide) on the human body. Kendall stated that it soon might be possible to prolong life ten or fifteen years if people would drink deutrium oxide

1/5 of the body water is replaced by heavy water, which is H_2O in which the H atom has been replaced by an atom of double weight, the process of metabolism is stimulated and goes on at a faster rate with an accompaning increase in temperature. The heavy water stimulates the nervous system which controls, in part, body temperature. Dr. Barbour believes that the deutrium oxide delays the stream of adrenalin in the blood. The effect of the heavy water can be counteracted when a drug is administered simultaneously which depresses the sympathetic nervous system.

EASTERN U. S. ONCE SEA SHORE

Doctor Ruedemann of the New York State Museum at Albany, indicated in a paper presented before the Academy his belief that some 3,000,000 years ago a mighty prehistoric sea stretched from Newfoundland to the gulf states. His belief is substantiated by the discovery of fossils of animal life in the area. The paper's title was "Plankton and Radiolarion ooze in paleozoic formations of New York."

The members of the Nation Academy of Sciences who attended the annual dinner saw the following awards made: The Mary Clark Thompson Medal to A. W. Grabau, geologist; the James Craig Watson Medal to E. W. Brown, astronomer; the Henry Draper Award to C. E. K. Mees, of the Eastman Kodak Company; and the Agassiz Medal to Martin Knudsen, oceanographer.

Dr. E. C. MacDowell, geneticist of the Carnegie Institution, expressed his opinion, founded on the study of a series of experiments, that science may discover how to develop resistance against spontaneous malignancies.

The capacity of an embryonic organ to differentiate the embryonic tissue in its neighborhood was demonstrated by an account of an experiment performed and described by Dr. Schotte of Amherst College, in which tadpoles developed eyes and

THE NEW VORTEX MECHANICS

(Continued)

CARL F. KRAFFT

The structural relationship between protons, electrons, and neutrons were explained in the previous issue of this magazine. The underlying idea is that there is nothing arbitrary in nature — the different elementary particles and their properties being determined by the principles of geometry, and not by arbitrary postulates as in the nuclear theory. It is impossible in these short articles to give a complete presentation of the new vortex theory, but a more detailed account of the same may be obtained, free of charge, directly from the author.

Obviously the vortex theory and the nuclear theory cannot both be true. One or the other will have to fall. Abandonment of the nuclear theory will not mean, however, that all the mathematical work of the last two decades will have gone to waste. Most of it can be transferred directly over to the vortex theory. For example, although the vortex atom has no nucleus, it does have a structural center to which all parts of the atom are firmly bound. Its free electrons are also on the periphery of the atom, just as in the nucleated atom. As is so often the case with two rival theories, the vortex theory and the nuclear theory are both equally applicable to most physical and chemical phenomena, but there the certain clear-cut cases which definitely disprove the nuclear theory.

The fact that nearly all substances constituent atoms or molecules must have exactly the same rigidity. It is conceivable that skeletal structures formed of vortex rings might possess considerable rigidity, but how any condition of glass-like rigidity could exist in the nucleated atom with its widely-scattered electrons (not to mention the wave atom) is beyond the understanding.

The position of nuclear physicists today is indeed pathetic. In order to deduce their atomic nucleus from alpha-particle deflection experiments (which form the very backbone of the nuclear theory) they have to proceed upon the assumption that the laws of electrodynamics hold true within the atoms, although their own experiments (on supergravitation for example) have shown this assumption to be erroneous.

For those who are chemically- rather than physically-minded, one more example will be given. Diborane is a substance which has actually been produced in the chemical laboratory and is in perfect agreement with the vortex theory, whereas under the nuclear theory it could not exist. Its molecule consists of two boron atoms and six hydrogen atoms so that under the nuclear theory it would require a boron atom with at least four valence-electrons, whereas the nucleated boron atom has only three.

(To be continued)

(Address of the author: Carl F. K[redacted] 251 [redacted] Stree[redacted] W.. [redacted]t-

The Scientific Press

—A Bulletin of the Latest Scientific News—

Volume 1 MAY, 1937 Number 5

THE NEW VORTEX MECHANICS

Copyright 1937 by Carl F. Krafft

(Continued)

CARL F. KRAFFT

In view of the two-faced attitude of certain schools of modern physics, it is desired to state at the outset that the new vortex atom is not a mere symbol or mathematical abstraction, but is intended to represent the real atom as it actually exists in nature. It is the writer's contention that the new vortex mechanics is potentially capable of accounting for all physical and chemical properties, and that neither arbitrary postulates nor mysterious "photons" or "wave functions" are necessary for this purpose. The new vortex mechanics does not contradict the quantum theory, but only removes the veil of mystery therefrom by providing an orderly system of atomic structure as a physical basis for the quantization of energy.

The "ether" which the writer frequently refers to is not a material substance, but a sort of mind-matter substrate of which the world is made. Its undulatory configurations constitute light and electromagnetic waves, while its vortical configuration constitute the atoms of matter. Its objective aspect constitutes the physical world, while its subjective aspect constitutes mind or consciousness. Any further inquiry as to what ether is made of would be a meaningless question because the phrase "is made of" has reference to the resolution of something into its chemical ingredients, and the ether does not have any chemical constitution at all. However, if the reader should insist on a direct answer to this question, then it may be replied to by saying that the "ether" in vortex mechanics is made of the same kind of stuff as the waves in modern wave mechanics.

In the March issue it was explained that two vortex rings could arrange themselves for rolling contact in either of two configurations, one such configuration being the proton and the other the electron. Apparently these differ from each other only in the direction of vortical rotation, which would account for the difference in the signs of their electrical charges, but not for their difference in mass. In fluid systems, however, a reversal of the direction of flow completely changes the nature of the system. The reason for this cannot be explained in detail here, but can be illustrated with a simple model. If two electric fans are arranged to blow away from each other, they will send streams of air ten feet or more in opposite directions. If now the direction of rotation of each fan is reversed, there will be no perceptible disturbance ten feet away in either direction. The two electric fans bear the same relation to each other as the two vortex rings in the proton and [redacted]

THE SCIENTIFIC PRESS

Published Monthly by
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THE NEW VORTEX MECHANICS

(Continued from page 25)

If two vortex rings are arranged in such a way that the flux between them is radially outward, then the polar flux of one will be in opposite direction to that of the other, which will prevent the two rings from approaching as closely towards each other as in the reverse arrangement where the flux between them is radially inwards and the polar flux in directions away form each other. It should also require less energy to separte them in the former case than in the latter case, which is just another way of saying that the former arrangement has less internal energy than the latter. Now, according to Einstein's equation, the energy in ergs is equal to the mass in grams multiplied by the square of the velocity of light in centimeters per second. Consequently the former arrangement will also have less mass than the latter, from which it must be concluded that the former arrangement represents the electron and the latter the proton.

The upper diagram represents the neutron and the lower diagram the hydrogen atom. Each has an atomic weight of about 1.008. The neutron is almost indestructible whereas the hydrogen atom is very unstable. The reason for this is obvious from the diagrams because in the neutron the proton and the electron overlap each other so that they cannot be separated whereas in the hydrogen atom they are spaced apart from each other so that extraneous forces can easily pry in between them and separate them.

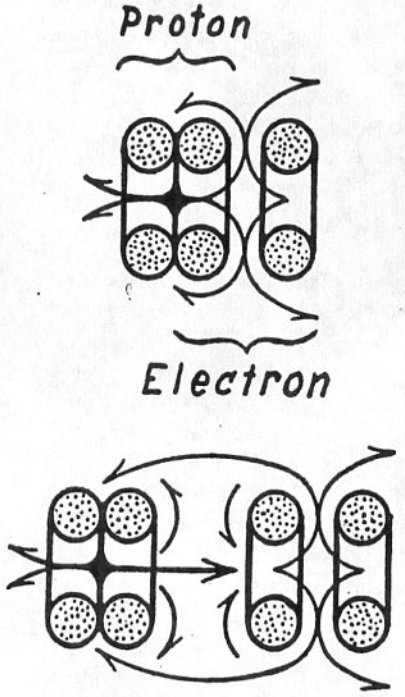
The lower diagram also explains why protons and electrons cannot fall completely into each other. Upon close approach their adjacent surfaces will rub each other in opposite directions as indicated by the short curved arrows, and in terms of vortex mechanics a sudden transition from flux in one direction to flux in the opposite direction means repulsion. It is typical of the vortex theory that wherever there is an empirical fact, there is also a geometric configuration adequate and appropriate to explain it. Explanations like these are conspicuously lacking in the nuclear theory. Arbitrary postulates and mathematical verbiage are poor substitutes for geometric necessity, even if bolstered by the prestige of high authorities.

It is generally stated that like electric charges repel and that unlike

SUN 1,500 DEGREES COOLER

According to Dr. R. B. King and Dr. S. A. King of the Massachusetts Institute of Technology and the Mt. Wilson Observatory, respectively, the sun has a temperature of about 4,500 degrees instead of 6,000 degrees as has been estimated in the past. The conclusion was based on a number of recent experiments involving the electric furnace.

charges attract. This, however, is not the whole story. If we charge one body electrostatically to minus 100 volts, and another body to minus 200 volts, they will repel each other because they have like charges. But if we take these two bodies with their electric charges into some region of the upper atmosphere where there is an absolute potential of minus 150



volts, they will attract each other. Electrostatic attraction and repulsion is therefore not merely a function of the charges, but also depends on the cooperation of the environment — on the way in which the circulating ether of a proton or an electron encounters that from external sources.

Furthermore it is not necessary to explain electrostatic attraction and repulsion separately, for the one will be found to depend on the other if the environment is taken into consideration. The movement of unlike charges towards each other necessarily involves the movement of each of these charges away from other like charges in the environment. In electrostatics the environment, although hardly ever mentioned in textbooks, is just as important as the electrically charged bodies themselves.

The mechanism of electrostatic action is best illustrated by the diagram of the hydrogen atom. The proton and also the electron will keep the surrounding ether in circulatory motion, and these ether currents will necessarily encounter and rub against other ether currents from external sources so as to be repelled thereby. The proton and the electron will therefore be repelled from all sides, except from the sides adjacent each other. When a proton is in close proximity to an electron, the outward polar or axial flux from the proton will form a continuous line of flow with the corresponding inward flux of the electron, and will find an external return path through the radial or peripheral flux. These circulating streams of ether which interlink the proton with the electron will assume the form of a larger vortex as indicated by the longer arrows on the drawing, and will be endowed with the same stability that is characteristic of vortex motion generally. Attraction between unlike charges necessarily results from the formation of such larger vortex, because it is only on its external sides where it will rub against and be repulsed by ether currents from extraneous sources. Internally it will encounter only its own axial flux, which will always be in the same direction and will therefore not cause any rubbing and consequent repulsion.

(To be continued)

THE SCIENTIFIC PRESS

Published Monthly by
The Scientific Press Publishing Co.,
La Porte City, Iowa.

Russell F. Moore, Editor

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THE MYSTERY OF LIGHT

(Continued from page 29)

"quanta". Each quantum is equal to a constant "h" times the frequency of the radiation. "h" is a universal constant of nature which may best be defined by calling it a energy-time relationship which, expressed mathematically, is equal to .00000000-0000000000000000000655 erg-seconds. The quantum theory credits light with being composed of both corpuscles and waves. Recent evidence is believed, by some, to indicate that the elementary particles of matter, as well as radiation, can simulate both particles and waves. The conclusion to be drawn is that waves and particles are two manifestations of the same thing.

In general it may be possible that a new system will be formed in which some old principles and some new ones are combined. Our universe has many phenomena in it which must be correctly linked together so that we get an orderly system. There are too many "mysteries" and too few solutions. Under any new system the data now collected must be correlated so that the universal system which governs the cosmos can be discovered. The explanation of light is so closely related to many other phenomena that if the correct explanation for it is found no doubt the structure of the atom, the nature of electricity, of gravitation, of magnetism and so on will be revealed.

A train constructed of glass is soon to be exhibited in the important cities of England. This unique train was made by British glass manufacturers to advertise their products.

THE NEW VORTEX MECHANICS

By Carl F. Krafft

The positron or positive electron is thought to have no special significance in problems of atomic structure because it appears to have only transitory existence and is probably nothing else than a nascent proton. It cannot be assumed that the protons which are in the universe today have always been there, or were put there by some special act of creation. The only truly scientific view is that protons are being continually produced and destroyed, just like everything else. When two vortex rings are brought together in such a way as to form a proton, the electric charge on it will appear immediately, because that extends only to its immediate surroundings. Its mass, however, will be formed more slowly because its inertia or gravitational field, on which its mass depends, is not confined to its immediate surroundings.

A similar phenomenon is probably at the basis of radioactivity. When an ordinary atom captures a high-velocity particle so as to form a radioactive atom, the new electrical configuration will be formed instantly, but this will in turn throw the masses of all the protons out of equilibrium. A readjustment will commence immediately, and if the new atom does not possess the necessary symmetry or other conditions essential for its stability, it will eventually disintegrate.

University of Michigan astronomers at the McMath Observatory are taking moving pictures of the sun using a 50-foot tower telescope, the largest and most powerful instrument of its kind in the world.

Dr. William Beebe has conducted twenty-five expeditions for the New York Zoological Society. During his last expedition Dr. Beebe walked for a quarter of a mile on the ocean floor observing marine life.

Modern chemistry began when the French chemist Lavoisier introduced the balance in laboratory experimentation.

Current Science News

PREHISTORIC FOSSIL

To the paleontological collection of the Field Museum of Natural History has been added a fossil skeleton of a **Eleutherocercus.** This pre-historic member of the Glyptodont family inhabited South America, and it was there that the remains were recently discovered.

SIZE OF BRAIN

According to Ales Hrdlicka of the Smithsonian Institution, the human brain continues its growth until the age of fifty or slightly over.

WOMEN DRIVERS

Women drivers are reported to be less efficient than men, simply because of lack of driving experience rather than because of some deeper or more fundamental attribute.

WHAT NEXT?

Sheep are not wearing boots — no, it is to keep them from catching cold, but rather than to protect them from a foot disease.

CAT-FISHES OF THE NILE

The sacred cats of ancient Egypt were fed on fresh fish of a species reserved for them. Egyptologists tell us that this fish was a species of Silurus (cat-fish.) In fact, there were several species of cat-fishes so reserved. They were taken alive and kept in ponds for convenient use. The people who fed the cat-fishes were almost sacred themselves and received obeisance from the public. Their honorable office was hereditary and fell upon both sexes.

The books do not state whether the cat-fishes were reserved for the sacred cats because of their whiskers, but that is not at all impossible. The cat was symbolic of the sun, as was also the chief god Ra. Egyptologists do not say so, but it may not be irreverent to suggest that the cat's whiskers reminded the animal-worshiping Egyptians of the sun's rays, and a whiskered fish may have seemed to them Ra's own choice of sustenance for the Great Cat.

(Editor's note: The above note was reprinted from the February, 1937 issue of ACQUARIUM NEWS and the author was Ida M. Maller.)

SNOWFLAKES

The diversity of form taken by snowflakes furnishes an interesting study of which few people are aware. Hundreds of micro-photographs of snowflakes are available, revealing an amazing number of designs of varying beauty and complexity. The structure of the snowflakes is greatly influenced by the nature of the atmospheric conditions experienced by the snowflakes by their descents. So important is this influence that to some extent these conditions can be deduced from a careful study of the flakes.

CLOUD CHAMBER

The Wilson Cloud Chamber which enables the tracks of alpha particles and electrons to be seen and photographed is a familiar instrument to almost everyone. By saturating the dust-free air within the chamber and then by sudden expansion causing super-saturation the vapor condenses on the ions present and consequently we get the tracks of the ion. However, it is sometimes impossible to determine just wh[illegible] the co[illegible]sati[illegible] ta[illegible]ace

and when the resulting track will appear. Various means have been used to overcome this difficulty which complicates the photographing of the tracks. The simplest is perhaps the taking of many exposures so that some photographs of the phenomena to be studied result. Another means sometimes employed which does away with making so many exposures is the use of the cosmic ray counter or detector (used when these tracks are to be photographed,) which proves for the expansion and subsequent photographing at the proper moment. Attempts have been made to produce continually sensitive chambers, but most of the attempts have resulted in chambers suitable for visual observation only.

ANNOUNCING

THE NEW VORTEX ATOM

Edited by CARL F. KRAFFT

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La Porte City, Iowa

The Scientific Press

—A Bulletin of the Latest Scientific News—

Volume 1 JULY, 1937 Number 7

HERSCHEL AND EINSTEIN

TWO COSMIC RIDDLES AND ONE SOLUTION

AT the last physicist's meeting, held in the Silesian state Salzbrunn, in Germany, the Berlin physicist Dr. Hermann Fricke presented an explanation for the force of gravity which, if found valid, would provide an entirely new world-picture and would solve a host of problems.

Ever since the time of Newton the force of gravity was represented by physicists as a tension acting in empty space. Now Fricke considers this old theory unsatisfactory since gravity, in his opinion, results from an attenuated ether-streaming or radiation which moves in a direction generally opposite to that of light-radiation.



Dr. Hermann Fricke

The old established view would be completely changed by the discoveries of Fricke, according to which the force of gravity is to be regarded as really a sort of dark-radiation travelling in a direction opposite to that of the light-radiation. His conception rests primarily upon a simple but very significant **numerical relationship** which he discovered and which furnishes the key for a new explanation of the cosmos. This numerical relationship tells us that the atmospheric temperatures of the celestial bodies are proportional to their gravational forces. On the sun, where the gravational force is thirty times greater than on the earth, the temperature is also thirty times higher. Its calculated value would then be about 6,000 degrees Centigrade, which has been verified experimentally. The sources of the high temperatures of the stars would then be transferred to their atmospheres. There the temperature is maintained as long as the force of gravity does not change. The dismal prophesies about the supposedly unavoidable heat-death of the sun are not indorsed by Fricke, who also does not believe in the widely promulgated stellar evolution theories of Eddington, Jeans, etc. It is undoubtedly in Fricke's favor that scientists are now generally of the opinion that the sun's temperature has not changed appreciably for billions of years. Nor have any cooled-off suns ever been observed.

Thus an old theory as to the constitution of the sun again takes on sig-

(Continued on page 41)

have to find a new job since on the moon she would weigh a mere 60 or 70 pounds and an average man would weigh around 15 or 20 pounds.

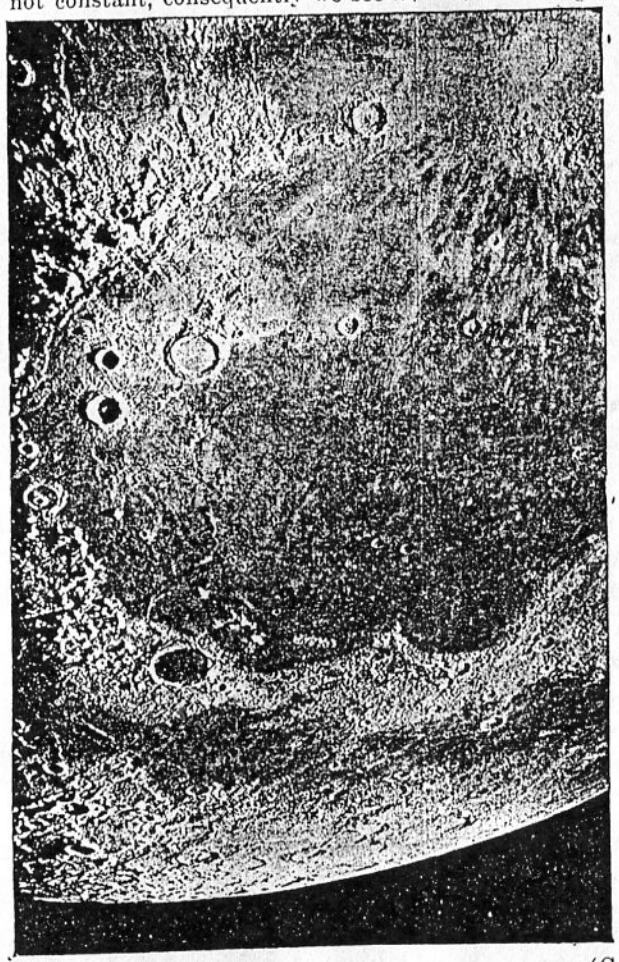
The moon goes around its orbit in 29 days, 12 hours, 44 minutes, 2.8 seconds, if calculated with reference to successive overtakings of the sun. If calculated with reference to a fixed star it completes the trip in its revolution in about 27¼ days.

Since the period of rotation coincides with that of revolution, the same side of the moon is always turned towards the earth. For this reason 41% of the moon's surface has never been viewed by the eye of man. This figure is not 50% because the moon's speed with which it circles the earth is not constant, consequently we see a tiny portion around the edges of the moon, also, sometimes it is tipped on its axis at a different angle, thus revealing a portion of the polar regions. 41% of the surface is seen all of the time, 18% some of the time and 41% none of the time.

The point of the orbit which is nearest the earth is called the perigee, the point which is most distant is the apogee and a line joining the two, the line of apsides.

The large dark plains on the surface (see the illustration) are termed Mare.

The most interesting feature of the moon's surface is the abundancy of craters. These craters vary from a few yards in diameter to many miles and are as high as 18,000 feet. (See illustration.)



The broad white rays diverge from the plain rings.

The story of the man in the moon is as ancient as the most ancient of races. Even the modern version of the story is hundreds of years old. According to this story, an old man, while gathering wood on Sunday was accosted by an angel, and asked if he had forgotten that the day was Sunday and that he therefore should be resting. The old man replied that he was so poor that he had to work every day of the week in order to keep alive. Upon hearing this the angel banished him to the moon where he could forever observe "Moonday".

Our planet has but one satellite,

(Continued on page 39)

THE NEW VORTEX MECHANICS

Copyright 1937 by Carl F. Krafft

(Continued)

CARL F. KRAFFT

In any theory of atomic structure, physical and chemical properties must be determined by the peripheral architecture of the atom or molecule. In the nuclear theory, as well as in the vortex theory, the hydrogen molecule is similar to the deuterium molecule in that both are four-sided structures with two removable electrons which accounts for their similarity in properties. The nuclear theory, however, does not explain why helium is inert. The nucleated helium atom is also supposed to have two removable electrons and should therefore be chemically active, just like hydrogen and deutrium. As Thomas Huxley told us long ago, when theories and facts conflict, the theories must be changed, and not the facts. Nuclear physicists, however, would reverse this proposition by ascribing unprecedented properties to the peripheral electrons of their nucleated helium atom.

Nuclear physicists tell us that the peripheral properties of atoms and molecules are determined by the number of outer electrons, but they do not explain why helium with only two electrons is so similar to neon with eight electrons, while carbon with four electrons and oxygen with six electrons are so different from neon. Neither have they ever explained to us how one or more neutrons can be thrust into or knocked out of the crowded interior of the atomic nucleus (in passing from one isotope to another) without disrupting the whole works—not to mention the problem of coughing up an alpha particle from the nucleus while the rest of the atom remains asleep. All these difficulties are completely eliminated by the vortex theory. The vortex atom is so constituted that a deuteron can be substituted for a proton, or a double-weight neutron for an ordinary neutron, without materially changing the peripheral structure of the atom or molecule. Radioactivity can also be satisfactorily explained because in the vortex theory the alpha and beta particles are ejected from the periphery and not the center of the atom.

In the vortex theory the helium atom consists of two ordinary protons and two negative protons. When it is subjected to rough treatment, as during an electrical discharge, one or both of these negative protons may lose their terminal vortex rings so as to eliminate their outermost electrons, resulting in the production of singly or doubly charged helium ions, e. g. alpha particles. The erstwhile negative protons are thus converted into neutrons. Each of these neutrons consists of three vortex rings, the inner two of which constitute an electron whose connection with the neighboring protons has not been disturbed. The helium atom as a whole is therefore not destroyed by the process of ionization. In the hydrogen or deuterium molecule, on the other hand, the integrity of the entire structure will be destroyed if the peripheral electrons are removed.

The question has frequently been asked whether the new vortex theory will account for spectral lines. It is

the writer's contention that this new theory not only accounts for spectral lines, but that it is the only theory which does account for them. Every oscillating system which has any definite frequency of its own **must possess structure**, and if its structure is known, then the calculation of its frequencies of vibration is a mere matter of mathematical routine. The problem of accounting for spectral lines therefore resolves itself into the problem of determining structure, and the reader may draw his own conclusions as to which lends itself more readily for structural determination—the nucleated atom or the vortex atom.

There is still much uncertainty as to just what happens when an atom is absorbing or radiating energy. In fact, an exhaustive study of this aspect of the problem with reference to the vortex atom has not yet been made, but there is every reason to believe that the results of such a study would be most gratifying. It may safely be said that all the successful calculations of spectral frequencies which have been made under the nuclear theory can be transferred directly to the vortex theory without any material changes. In fact, the vortex theory will lend itself even more readily for this purpose than the nuclear theory because the vortex atom is composed of vortex rings which may be assumed to be capable of vibrating at definite frequencies, just like bells or tuning forks, whereas the nucleated atom, consisting of point charges of electricity, would have no definite frequencies of its own. This has beeen admitted by an authority of no less eminence than Sir Arthur Eddington, who states on page 46 of his book "New Pathways in Science":

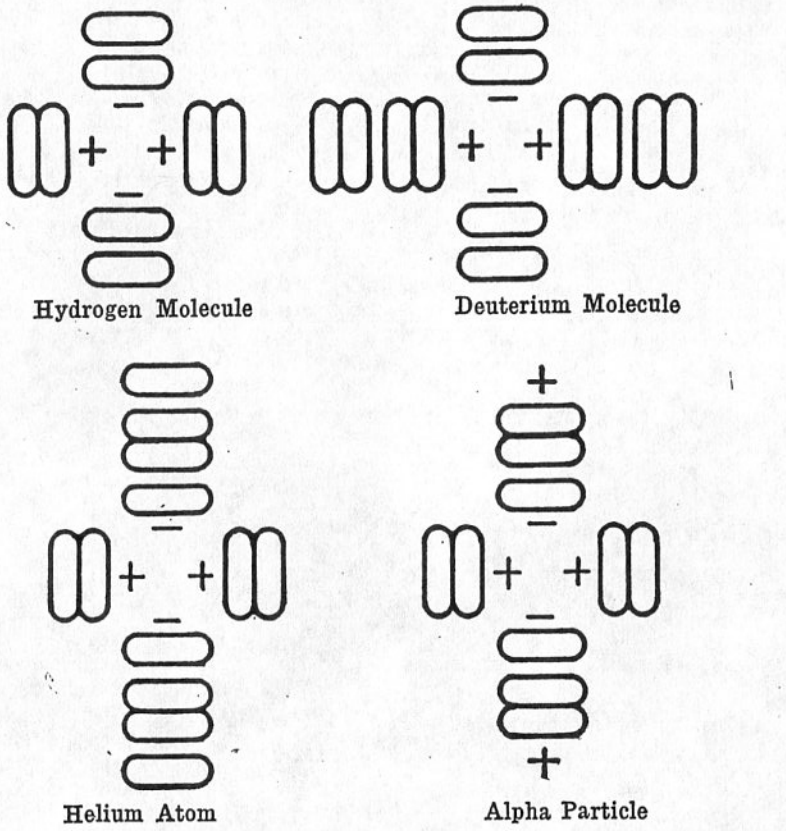
"In the atom constructed of particles, (the Bohr model) there is no trace of the period; there is no condition or configuration which goes through a cycle in the period of the emitted light waves."

Eddington then goes on to explain that this deficiency in the Bohr atom has now been remedied by the introduction of the Schrödinger wave equation, but he has evidentally overlooked the fact that Schrödinger's wave-equation is merely a differential equation of general applicability, and is just as applicable to vortex motion as to wave motion. By merely substituting the expression "vortex function" for "wave function", all scientific literature dealing with wave mechanics could be transferred directly over to the vortex theory.

It is usually assumed, although on no evidence whatever, that atomic radiation or obsorbtion depends solely on the translatory motions of electrons as point-charges, and that the protons and neutrons play no active part in the process. If this were true, then the inert gases would be very deficient in spectral lines of the longer wave-lengths because, being chemically inert, they should not be capable of liberating their outer electrons as readily as the other elements. Actually, however, they seem to have no particular difficulty in emitting or absorbing radiation. On the other hand an element like sulphur, which with all its positive valencies should give an abundance of visible radiation, is peculiarly deficient therein.

In the vortex theory we are not confined to a translatory motion of point-electrons as an explanation for radiation or absorbtion of energy. The vortex rings themselves, of which the electrons, protons, and neutrons are composed, may be capable of autonomous vibration, not only in the fundamental mode, but also in a series of "overtones". The frequencies of these "overtones", however, will not be exact multiples of fundamental as in the case of musical instruments, because a change in the mode of vibration will in turn affect the tensions of the electric fields (or extraneous lines of ether-flux) with which the vibrating vortex rings are interlinked, and on which their rate of vibration depends. All this is in perfect agreement with experimental facts, since exact overtones never occur in spectral series.

The frequencies of light are very important in the growth of plants, for example, green is actually poisonous to one-celled plants.



THE MOON

(Continued from page 36)

others have more. For example, Mars has two, Uranus four, and Jupiter ten.

Here are some interesting facts and figures concerning the moon.

Diameter: 2,160 miles.

Mean distance from earth's center: approximately 238,830 miles.

Equatorial velocity: 10 m. p. h.

Density: 3.57 (of water); 0.63 (of the earth).

Mass: 78 billion billion tons (or about one and one fourth thousandths the mass of the earth.

Synodical period: 29.53 days. (Period taken to travel orbit).

Velocity: 2273 m. p. h. (or 3334 feet per second).

made history. The actual books, first editions, priceless, are photographed, a single page is reduced to only an inch. The book-films may then be read with the aid of a viewer or by some other means which magnifies the size. The first two books to be so recorded and made available to the public are Charles Darwin's "Origin of the Species" and Hooke's "Micrographia". For some time books and public documents have been reduced to film records but as far as we know this is the first time such rare old scientific books have been made generally available. This project is worthy of attention and co-operation.

Electricity From The Sun

Dr. A. G. McNish, at the recent meeting of the American Association for the Advancement of Science in Denver, Colorado, described a number of discoveries made a few months ago by the department of terrestrial magnetism of the Carnegie Institution of Washington. Most important of these discoveries was the discovery of an electric curent which shoots out from bright spots on the surface of the sun, in the form of ionized rays. These rays flow to the earth carrying an enormous amount of electricity. These ray emanating spots are flares of flame, some as large as the earth. The electricity carried does not actually reach the earth's surface, but circle around in the rarified air some thirty miles above the surface. These electric currents, of about 75,000 amperes, flowing counterclockwise around our northern hemisphere affect the radio and compass.

Paraffin wax is being used as a protective coat for fruit shipped long distances from grower to consumer. The protective coat preserves the freshness.

Will someone please decide whether or not heavy water will slow down metabolism and by so doing make old age more comfortable? Professor Kendall of the University of Edington says that it will; another school has found by experimentation that rather than slowing down metabolism it is actually stimulated. It is the humble view of the editor of this department that direct and carefully recorded experimentation should reveal the truth. What are we waiting for?

Paper can be manufactured from ordinary wheat straw.

The planet Jupiter is the largest in the sun's family. It has a diameter of about 86,720 miles, eleven times as great as that of the earth. It is approximately 483,200,000 miles from the sun. A year on Jupiter, or the time it takes to make one revolution around the sun lasts 11.86 earth years. A day on Jupiter lasts for only 9 hours and 55 minutes. Jupiter has nine moons, three of the nine are LARGER than our own planet!

In the AUGUST Issue

BEGINNING "Our Universe", in the next issue of the Scientific Press will begin the first of a series of six articles written by Russell F. Moore on "Our Universe". The articles will be as comprehensive as possible dealing with the formation of our system. It will be a general unveiling of "Our Universe".

"The New Vortex Mechanics" the article of Mr. Krafft's will be continued in this issue.

ALSO Mr. Krafft has favored us with an article on the structure of proteins. This article will contain some NEW material, perhaps something that has never been advanced before. It will be illustrated.

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ECLIPSE OF THE SUN

On June 8th, the longest eclipse of the sun in 1,200 years occured. No wonder scientists spent months in preparing for the big event! Because the shadow of the eclipse, the 7,494th in history, moved almost entirely over water, astronomers had to go a long way to observe this rare phenomenon. One expedition went half way around the world to tiny Canton Island in mid-Pacific, 5,000 miles south-west of San Francisco, where the eclipse lasted for over two minutes. (At 8.04 A. M., June 8, 1937). At this position, where the National Geographic Magazine and the United States Navy sent an expedition, the shadow was traveling around 2,000 miles per hour. On the scene, atop one of the buildings, was a radio announcer who flashed by radio the details of the eclipse as they were taking place.

On another part of the globe, 14,000 feet high in the Andes, American, Peruvian, and Japanese astronomers observed the eclipse. The three most important expeditions in Peru included the Hayden Planetarium of the American Museum of Natural History—Grace Line, the Brown University, and the Japanese party.

Another expedition which was constituted of Dr. John Stewart, Princeton astronomer, and James Stokley, assistant director of Franklin Institute in Philadelphia, was aboard a steamship in mid-Pacific, at a point where an island, Sarah Ann, was supposed to be. At this point the eclipse lasted seven minutes and four seconds, the longest in centuries. Whether the missing island never existed or sank is not known. The two scientists took measurements of the changing brightness of the sun and colored photographs.

The shadow started south of the equator near the Fiji Islands. The shadow itself was a black spot appromixately 150 miles in diameter. It moved across the Pacific Ocean in 3 hours and 20 minutes [illegible] Peruvian coast just before sunset. The average speed was 44 miles per minute. Early and late in the day when the shadow struck the earth at a more slanting angle the speed was increased, likewise when the sun was directly overhead the speed was decreased to about 21 miles per minute. The path of the partial eclipse was 2,000 miles wide, reaching from California to Florida.

The purpose of these expeditions was, of course, to study features of the sun visible only during an eclipse. By learning more about the structure and composition of our nearest star, the sun, we will have a better idea about the origin of the universe. Two of the main studies were the corona, a luminous halo, or envelope of white light a million miles wide surrounding the sun, and the sun's atmosphere, a layer of blazing gases thousands of miles thick. The nature of the corona is a mystery. Some scientists believe that it is mainly oxygen, but oxygen in a state that is not known on this planet. Measurements were made of the brightness of the light of the eclipse. These measurements will assist studies regarding the state of ordinary matter on the sun. Other studies were made of the sun's magnetic storms, sunspots, and radio static.

One of the instruments used in making these various observations was the Schmidt camera, which was fitted with fast lenses and was able to scan 20 astronomical degrees. Another instrument used was a special camera which allows the subdued light coming from darker portions of the sun's corona to reach the photographic plate with about the same effect as the light coming from the lighter portions.

Though the eclipse was so far away that only a few people were able to observe it, modern photography, along with other modern scientific instruments, has preserved the happen[illegible]

THE SCIENTIFIC PRESS

Published Monthly by
The Scientific Press Publishing Co.,
La Porte City, Iowa.

Russell F. Moore, Editor

Clifford P. Ramback, Jr.,
Associate Editor

Subscription Rates:

2 months 25c
6 months 50c
One year $1.00

Advertising Rates upon request.

Editorial

THINKING

How many times have you actually thought today? Probably not very many. People let days go by without actually thinking. Some people die without thinking once from their day of birth.

Most people have a wrong impression of thinking. They believe that they are thinking when they are merely contemplating thinking or when they are memorizing.

What is thinking? Who thinks? In answer to the last question it might be believed that a student in some institution of learning does more thinking. Many times this is true. But many other times all the "student" does is memorize a string of facts, adding nothing. This is not thought. There must be a second step, the adding to of information gained. For example, when you read this page do you add anything to it? Does it make you draw on past experiences? OR do you merely read words so that when you have finished this particular column you can go on to another and read something else? When you have finished have you gained any more than is written on this page? This net gain is the product of thought. If there is no net gain, then you have memorized, maybe not even that.

How can one think? One of the necessary steps to thought is concentration which is simply clearing the brain of irrelevant matter, as well as of useless thought images. After all, human existence is nothing more than a series of thought images. With the mind in a receptive fertile condition, it is only necessary to find the germ, nourish it with past experience, and it grows into thought. This brings out the importance of careful observation and memory. Without these our reservoir of knowledge might give us erroneous information and so result in a warped thought. If you are reading it is not necessary for a thinker to read more than a line before he has found this germ of thought. Books and other reading must be studied, not simply read. Reading should not be the devouring of a series of words, but a series of thoughts. The words themselves are valueless to the thinker.

Now how have you been reading this? Are you devouring words? When you read "The words themselves are valueless to the thinker" did you extract the thought before passing on to the next line? Did you add anything to it? To think, one must use a clear mind, study thoughts and add to them by combining past observations.—O. V. W.

The Smithsonian Institution was established in 1846. An Englishman, James Smithson bequeated his fortune in 1826 to the United States for the founding of such an organization.

Protein Chemical Structure

Copyright 1937 by Carl F. Krafft

CARL F. KRAFFT

A close relationship between protein chemical structure and life has long been suspected, but there appears to have been no definite suggestion, until about ten years ago, as to what this relationship might be. In December 1925 the author conceived his spiral polypeptide theory, and in 1927, after many successful attempts to get it seriously considered by the accredited scientific magazines, published it himself in a monograph entitled "Spiral Molecular Structures, the Basis of Life". About a hundred copies of this were distributed among the leading universities. The fundamental principle of this new theory is that the polypeptide chains in living matter, (consisting of repetitions of the alpha amino acid residues -NH-CHR-CO are arranged in parallel helical spirals which grow endwise by assimilation of amino acid residues. In each species of plant or animal the specific arrangement of these spirals remains the same from generation to generation, which accounts for heredity and the constancy of the species. This has been the only mechanistic explanation for heredity which has ever appeared in scientific literature.

Different schemes have been suggested for connecting these spirals to one another, but there has been much uncertainty as to which form of connection actually exists in nature. There has also been some uncertainty as to whether the ultimate unit of living matter is represented by a single spiral, or by a cluster of spirals. In order to decide these questions it was necessary to know more about the structures of the atoms, and such information has now been furnished by the new vortex theory of atomic structure. We know, for example, that the nitrogen atom has one peripheral helium group and only three valence bonds, while the oxygen atom has two peripheral helium groups and two valence bonds. We have also learned about the branched valence bond. With the help of this information we can now rule out as geometrically impossible some of the protein chemical structures which have lately been proposed, and which have looked quite plausible on paper. For example, the hexagonal compartment system which was published by the author in 1931 in his book "Can Science Explain Life?" will have to be thrown out, and with it will have to go the entire "cyclol" system of Dr. D. M. Wrinch of Oxford, published five years later. We will have to go back to 1927 and look for a fresh start, beginning with the polypeptide spirals arranged in parallelism.

The main difficulty with the author's spiral polypeptide theory of 1927 has been that the free ends of the spirals occured alternately at opposite ends as successive amino acid residues were assimilated, each residue adding only half of a convolution. This difficulty was eliminated in 1937 by the introduction of the double-thread spiral, ("Life a Vortex Phenomenon", page 7) but only by making the assumption that amino acid residues were assimilated two at a time. This assumption, however, does not appear to be at all unreasonable if we give due consideration to the ether whirlwind which may be presumed to exist around the central longitudinal axis of every polypeptide spiral—a peculiar intermolecular electrical effect resulting from the systematic and unsymmetrical arrangement of atoms, and in some respects similar to the phenomenon of magnetism. The existance of such a magnetic whirlwind is not disproved

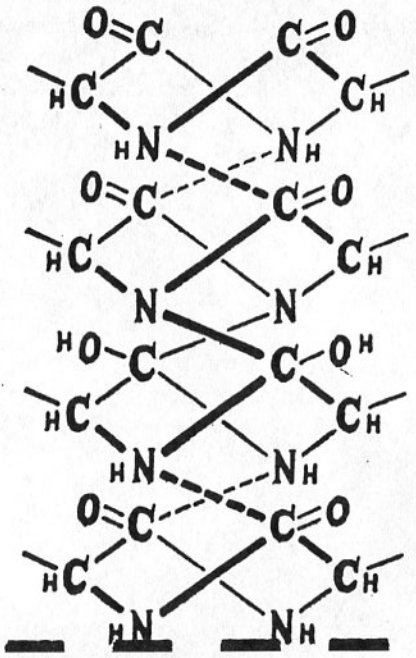
by the fact that proteins are not magnetic like iron. A piece of glass is also not magnetic, but yet we know that when it is placed in a magnetic field it will rotate the plane of polarization of light, although neither the glass alone nor the magnetic field alone will produce any rotation. The magnetic field must coact in some peculiar way with the individual atoms and molecules of which the glass is composed. Now a magnetic field is nothing but a whirlwind in the ether around the axis of the magnet, resulting from an unsymmetrical distribution of electron motions in the magnet itself. And since a polypeptide spiral is also electrically unsymmetrical, it may be assumed to produce a similar magnetic whirlwind around its own axis. The mere presence of a magnetic whirlwind of molecular dimensions is not sufficient, however, to constitute life. There must also be a chemical structure present which is so constituted that it can take on additional structural units along the line of its axis and still keep the same unsymmetrical configuration at its free end. There are many organic molecules which are electrically unsymmetrical (optically active compounds) and which may therefore be presumed to generate tiny magnetic whirlwinds in their immediate vicinity, but they are not constituted so as to satisfy this last-mentioned condition. Furthermore, in order to produce the complex hereditary patterns of the higher plants and animals, it is also necessary that this structure will connect laterally with other similar structures along at least three parallel lines. As far as we know, it is only the polypeptide spiral which will satisfy all of these conditions.

Such a magnet whirlwind around the axis of a polypeptide spiral will have a coordinating effect upon any amino acid residues in its immediate neighborhood, and if two such residues are simultaneously present, they will arrange themselves around the axis of the whirlwind in the form of a dioxypiperazine ring. With the ring held in this position it can be easily assimilated by the end of the spiral, under the proper conditions of hydrogen ion concentration, by transfer of the hydrogen atoms from the imido nitrogen to the carbonyl oxygen, and union along the dotted lines. After the addition of each dioxypiperazine ring the configuration of atoms at the end of the spiral remains the same as it was before, the spiral having been merely increased in length. The dioxypiperazine ring is slightly buckled during this process, but is not broken.

For a long time there have been two schools of protein chemical structure—the polypeptide school and the dioxypiperazine school. In view of what has just been presented, it appears that both schools were right in what they alleged, and wrong in what they denied.

Since each double-strand polypeptide spiral functions as an autonomous entity in the assimilation of amino acid residues, it appears that such a spiral by itself, rather than a group or cluster of parallel spirals, should be regarded as the ultimate unit of living matter. With each double-strand spiral functioning independently of the others, we are at liberty to arrange a number of such spirals into almost any hereditary pattern without interfering with the assimilation of amino acid residues by the spirals individually.

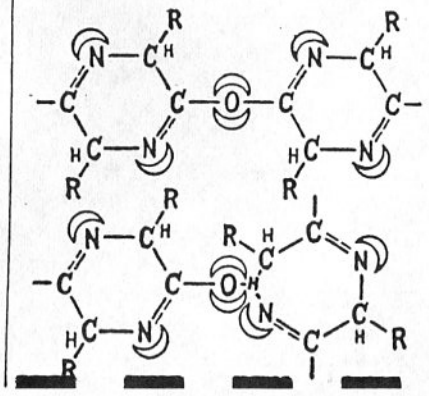
In determing the different ways in which adjacent spirals can be coupled laterally to one another, we must give consideration to the peripheral helium groups of the nitrogen and oxygen atoms, (represented by crescents in the diagram,) since these helium groups occupy considerable space and limit the closeness with which other atoms may approach. In 1931, in the author's book "Can Science Explain Life?" certain diagrams were presented showing a direct union between the imido nitrogen and the carbonyl carbon atoms of adjacent spirals so as to connect them in groups of three by means of triazine rings. Similar diagrams were published in the March 7, 1936 issue of NATURE by Dr. D. M. Wrinch of Oxford. In view of what is now known about the structure of atoms, such an arrangement would be geometrically impossible, not only because there would not be sufficient room for the peripheral helium groups of the nitrogen and oxygen atoms, but also because the nitrogen atoms in the double-thread spirals would not have any valence-



bonds available for this purpose. The carbonyl groups, however, do furnish suitable points for connection to adjacent spirals. After a carbonyl group has changed over into the hydroxyl form, it can extend over to a carbonyl (i. e. hydroxyl) group of an adjacent spiral and join the same after elimination of a water molecule. Couplings of this sort, however, can connect adjacent spirals at only two diametrically opposite points which may be sufficient for the formation of flat sheets or hollow cylinders, but not for the formation of complex hereditary patterns. There must be some other point at which connection can take place, but where can it be?

The branched valence-bond of the new vortex atom seems to solve the problem. According to this new system of atomic structure a valance bond does not need to terminate upon any one atom, but may be joined to the middle point of another valence bond. In the spiral polypeptide such a junction will be most likely to occur between the nitrogen atom and the alpha carbon atom, the hydroxyl hydrogen forming part of the junction itself. Since each spiral will then have four equally-spaced points

(Continued on page 60)



THE NEW VORTEX MECHANICS

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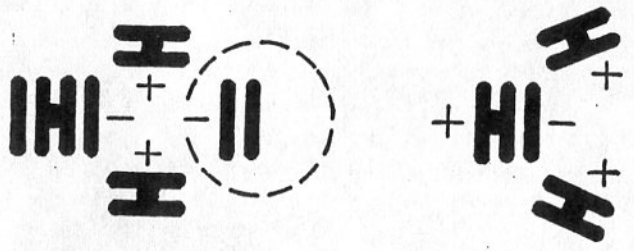
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CARL F. KRAFFT

Ordinary helium has an atomic weight of 4.0036. By substituting deutrons for one or both of the protons it should be possible to obtain heavier isotopes, and such isotopes have actually been reported. A lighter isotope of atomic weight 3.0170 has also been reported on several occasions (PHYSICAL REVIEW, Sept. 1, 1934, p. 437, and NATURE, Aug. 31, 1935, p. 334) but according to the vortex theory such lighter isotope could not exist. It would be a geometric impossibility. On the other hand the new vortex theory does require the existance of a particle of atomic weight 3 which is constituted as shown in the diagram. It should be a true atom and not a molecule because the negative proton (at the left) will keep it from going to pieces like a hydrogen molecule. It should be univalent chemically because of the single valence electron, and should be strongly electropositive because the protons to which the valence electron is attached are not guarded by peripheral helium groups as in the case of electronegative elements like flourine. In the gaseous state it should be capable of forming divalent ions as shown in the diagram at the right, which has been corroborated experimentally. It should behave in every manner like an element of the alkali metal series. In the periodic table it should occupy the position usually allotted to hydrogen, which does not exhibit alkali metal properties, either physically or chemically. That this particle cannot be an isotope of helium is also corroborated by the fact that no doubling of the helium spectral lines could be observed.

Its atomic weight is also irreconcilable with the theory that it is an isotope of helium. Normal helium has an atomic weight of 4.0036, while this alleged isotope has an atomic weight of 3.0170. The difference is 0.9866, or considerably less than 1, whereas the difference in atomic weight between the isotopes of all the other elements in the neighborhood of helium is greater than 1. If it were really an isotope of helium, then its atomic weight should be about three-fourths that of normal helium, or about 3.0027, which is far less than its observed atomic weight. On the other hand if it is a new alkali metal, then it may be considered as retaining only one-fourth of the normal helium structure, namely the one negative proton, which has an atomic weight of about 1.0009. The two positive protons may then be considered as parts of a hydrogen group and have a combined atomic weight of 2.0162. Adding up, this gives a total atomic weight of 3.0171.

During the winter of 1935-1936 the startling discovery was made by the Carnegie Institution of Washington that the force of repulsion between two protons changes over, upon close approach, into a force of attraction. A similar attractive force has also been observed between protons and neutrons. That such a force must exist has been obvious for a long time because otherwise that atom would

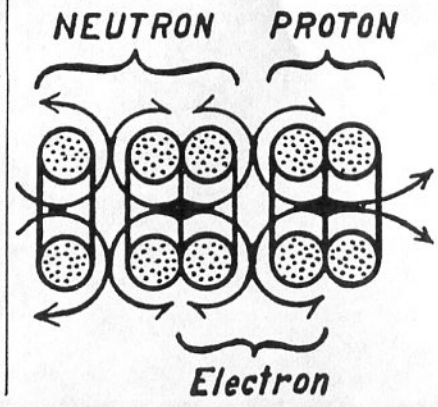


fly to pieces, but no explanation as to the cause of such a force had been presented until 1931 when the author predicted it on the basis of vortex mechanics (CAN SCIENCE EXPLAIN LIFE?, page 92). The basis of this prediction is shown in the diagram. When protons and/or neutrons collide, their contiguous portions form an electron which constitutes a link between the colliding particles and tends to hold them together.

A similar attractive force should also be exerted between two electrons upon close approach, since their contiguous portions would form a particle having the configuration of a proton. This has never been confirmed experimentally, but we do know that electron pairs are formed under conditions where a collision between two electrons would be likely to occur. It is conceivable that if such a collision occurs in just the right manner, the vortex rings on the contiguous sides of the two electrons may meet with true rolling contact and remain clinging together in the form of a nascent proton, while the vortex rings on the remote sides may slip off and form a new negative electron. The nascent proton would then constitute the positron of the electron pair.

Positrons have never been permanently isolated. They are known to exist only momentarily. The prevailing theory that a positron is immediately annihilated upon meeting a negative electron seems untenable because in electron pairs the positron originated in close proximity to a negative electron. But if positrons are not immediately annihilated, and do not exist permanently, then they must develop into some other particle, which can only be the proton. We know from the phenomenon of radioactivity that the elementary particles of matter do undergo spontaneous changes of this sort. This would also account for the recently discovered cosmic ray corpusles whose masses are intermediate that of the electron and that of the proton. These newly discovered corpuscles do not fit into the nuclear theory at all, but are in perfect agreement with the vortex theory. In fact, one could almost say that they were predicted under the vortex theory because on page 103 of the 1935 supplement of THE MECHANISTIC AUTONOMY OF NATURE the author made reference to a newly formed particle "whose electromagnetic mass has not yet had sufficient time to travel far enough outwardly into space to give it the normal mass of the ordinary proton."

(To be continued)



Protein Chemical Structure

(Continued from page 57)

on its periphery where it can be connected to adjacent spirals, there will be a predominant tendency to form rectangular lattices. The four-sided forms usually ascribed to the chlorophyll and haemoglobin molecules are evidence of such rectangular pattern. The fact that proteins crystallize in the hexagonal system is no argument against the rectangular form of molecule because molecules do not generally have the same shapes as the crystals they produce. Attention is also directed to the article on proteins in the Feb. 19, 1937 issue of DIE NATURWISSENSCHAFTEN in which the rectangular lattice structure was given preference from the standpoint of X-ray differentiation studies.

There is still much uncertainty as to the molecular weights of proteins because in the study of fibrillar molecules it is difficult to distinguish between fibre thickness and true molecular weight. There seems to be some evidence that the molecular weights of different proteins form a geometric series with a constant factor of 2, and with the first member of the series equal to about 17,600. It appears from this that the more complex proteins are merely polymerization products of the simpler proteins, so that it would be of utmost importance to know definitely the chemical structure of the first member of the series. Does it consist of one double-strand polypeptide spiral, or of a larger number of them in parrallelism, as for example four in the form of a square? These are questions which could be answered with the help of present-day experimental methods, but until they are answered it would be useless to speculate any further on the cross-sectional patterns of the more complex proteins. The fact that monomolecular layers of protein films have been produced with an area of over eighteen square Angstroms per amino acid radical seems to indicate that the fiber diameters of these proteins cannot be much greater than that of an individual spiral, although other experiments seem to show that the thinnest films are at least several times that thickness.

Besides carbon, nitrogen, oxygen, and hydrogen, there are also present in living matter a number of other elements in lesser amounts, like sulphur and phosphorus. These have not been considered here because they are not present in sufficient quantities to constitute regular structural elements of the ultimate units of living matter. For example, in a typical protein there is only about one sulphur or phosphorus atom to every hundred nitrogen atoms, whereas in order to constitute a regular building-unit of polypeptide spirals there would have to be about one sulphur or phosphorus atom to every one nitrogen atom.

It is impossible in this short article and in the present state of our knowledge to deal adequately with so complicated a subject, but the spiral polypeptide theory should not be condemned in its entirety just because some detail may have been slighted in this discussion. For example, it should not be supposed that the ether around the end of a polypeptide spiral partakes of no other motion than that of a simple whirlwind. Since the spiral is acid at one end and basic at the other end, there will also be a longitudinal component. And since the imido and carbonyl groups are arranged in definite rows along the sides of the spiral, there will also be lateral circulation.

The Scientific Press

—A Bulletin of the Latest Scientific News—

Volume 1 SEPTEMBER, 1937 Number 9

Protein Chemical Structure

CARL F. KRAFFT

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IN the article on Protein Chemical Structure in the August issue, the opinion was expressed that certain protein structures published by the author in 1931, and by Dr. D. M. Wrinch of Oxford in 1936, would have to be discarded. After the writing of that article, it has come to the author's attention that in the June 5, 1937 issue of NATURE, and in the June 11, 1937 issue of SCIENCE, Dr. Wrinch had published a new type of protein molecule, in the form of a hollow polyhedron, for the explanation of globular proteins like insulin. This new form of protein molecule is believed to be correct, and if considered in conjunction with the double-strand polypeptide spiral set forth in the August issue of THE SCIENTIFIC PRESS, will enable us to formulate a more satisfactory theory of protein metabolism than has ever been presented before. In both of these types of protein chemical structure the ultimate structural unit is the diketopoperazine (sometimes called "dioxypiperazine") ring. As shown in the diagram, this may exist in either the keto-form, or in the imidol — (sometimes called "enol—") form. Since the imidol-form would be the more active chemically, we may assume that the latter is the form in which it exists whenever it gets separated from the end of a double strand spiral. A number of such chemically active rings in the presence of each other may then polymerize, first into groups of three to form triazine rings, and then by continued polymerization into a reticulated fabric. All of this is clearly shown in the diagrams, which are exact reprints from the author's book "Can Science Explain Life?", published in 1931. Although similar diagrams were not published by Dr. Wrinch until five years later (in the March 7, 1936 issue of NATURE,) nevertheless our scientific magazines are today presenting Dr. Wrinch as the sole originator of this subject-matter! Whether the credit for this "cyclol" theory goes to one person or another is not of any consequence. Questions of priority are of no importance in science. But the fact that **all of the diagrams on which the cyclol theory depends are covered by prior copyrights owned by the author,** ought not to be ignored by those who are in the business of publishing scientific literature. Arbitrary refusal by scientific magazines to recognize the real originators of new scientific ideas is not conducive to the orderly progress of science.

The part which Dr. Wrinch really did contribute was the idea of folding the cyclol fabric around into closed shells, so as to form hollow polyhedral molecules, for the explanation of globular proteins like insulin. Dr. Wrinch has shown that a series of polyhedrons can be formed in this manner, and that the second member of the series contains exactly 288

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The Scientific Press Publishing Co.,
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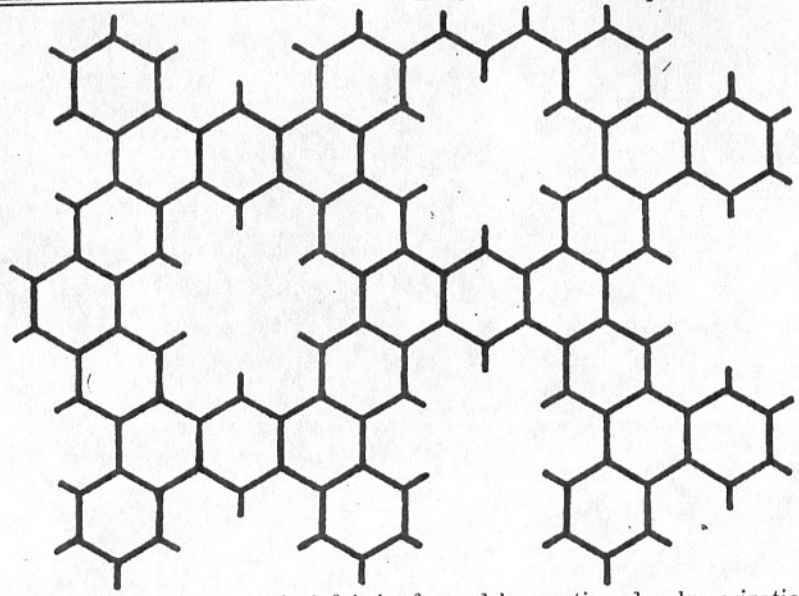
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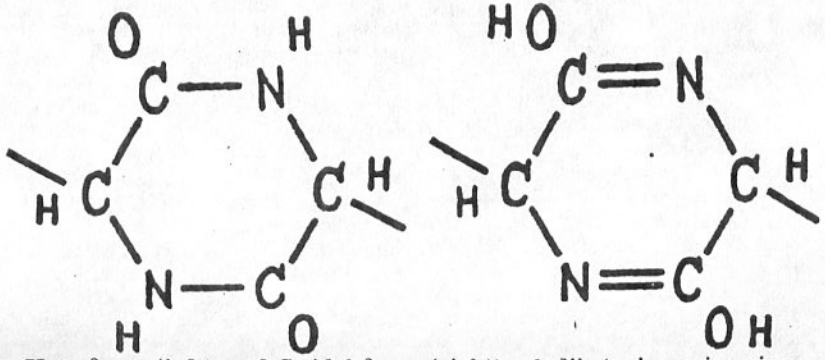
Protein Chemical Structure

amino acid residues, which is exactly the number found in certain natural proteins.

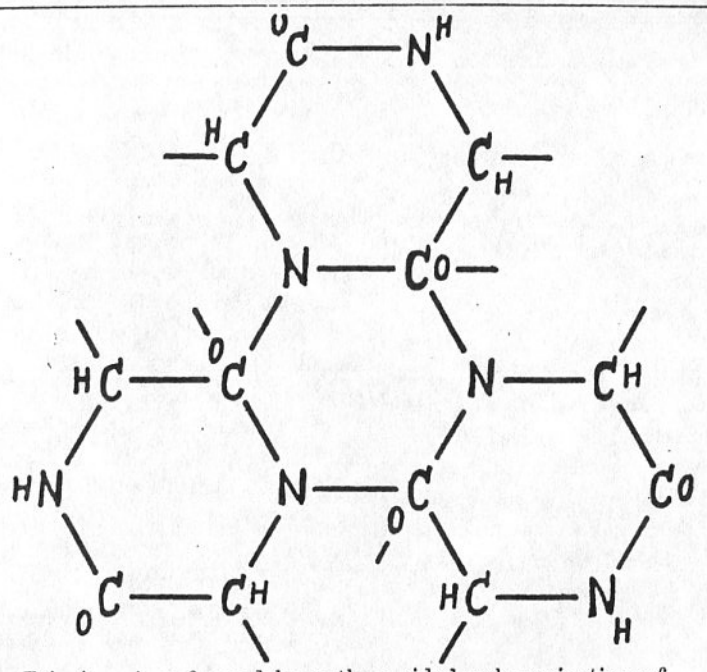
We may therefore conclude that proteins exist in two forms — the fibrous form and the globular form — and it appears to be only the fibrous form (i. e. the form which contains the double strand polypeptide spirals) which is responsible for life processes. Globular proteins are probably produced as by-products of protein metabolism, and may serve as food material for fibrous proteins.



Reticulated protein chemical fabric, formed by continued polymerization of amino acid residues into triazine rings



Keto-form (left) and Imidol-form (right) of diketopiperazine ring.



Triazine ring, formed by a three-sided polymerization of amino acid residues

OUR UNIVERSE

Russell F. Moore

INHABITANTS

THE universe is peopled by various things. First, the stars, varying in size. Our own sun is a small star, with a diameter of some 864,000 miles. This is indeed tiny when compared with the diameter of Antares, 400,000,000 miles. For convenience, stars have been divided into magnitudes, according to their brightness. A first magnitude star is the average of the first twenty brightest stars. So, we can have negative magnitude stars—for example, Sirus of Canis Major is of magnitude—1.6. The ratio of the difference in brightness of stars of different magnitudes has been established as 2.512. Therefore a star that is 2.215 times as bright as a fourth magnitude star is a third magnitude star, one that is 2.512 times as bright is of second magnitude, and so on. The faintest star that can be seen with the naked eye is of sixth magnitude. Some stars that appear faintly in powerful telescopes may be 18 or 19 magnitude stars. **Stars are incandescent bodies which shine of their own light.** In this they differ from planets which shine with reflected light.

The planets attend the stars. That is, in our own case there are a number of bodies that continually travel around a central star or sun due to gravitational attraction. There are thousands of planets. In our own system there are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto. The planets unlike the stars are dark bodies, shining of reflected light and possessing no heat of their own.

Besides the planets there are asteroids. These are tiny chunks of matter in our own system between the orbits of Mars and Jupiter. They are probably nothing more than meteoric rocks. Most of them are small; none are over 500 miles in diameter.

(Continued on page 66)

THE NEW VORTEX MECHANICS

(Continued)

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CARL F. KRAFFT

The subatomic particles and the atomic structures of hydrogen and helium having been dealt with in previous articles, we shall now take up the study of the heavier atoms. The atomic structures of lithium, beryllium, boron, and carbon are shown in the diagram, in which each line represents one vortex ring, viewed edgewise.

In the vortex theory the atoms of all elements are formed of hydrogen and helium groups, the hydrogen groups being always on the periphery and constituting the valence bonds. Since the helium atom is a four-sided structure, it can have hydrogen groups attached to either one, two, three, or four sides thereof, so as to produce the lithium, beryllium, boron, or carbon atom respectively. After the fourth hydrogen group has been attached it will not be possible to attach any more, but these hydrogen groups can then be substituted by helium groups so as to produce the atoms of nitrogen, oxygen, flourine, and neon respectively, thus completing the first horizontal row of the period table. The presence of exactly eight elements in the first horizontal row is thus accounted for on a purely geometric basis, and without conjuring with the mystic word "Octet".

The diagrams show only the predominant isotope of each element. The lithium atom, for example, is shown as the isotope of atomic weight 7 in which a group of five vortex rings connects the hydrogen group with the helium group. A group of three vortex rings, however, possesses the same structural characteristics as a group of five, in that both are neutrons and carry opposite charges at the two ends. By substituting a group of three for the five shown in the diagram, the lower isotope of atomic weight 6 would be produced. Since the external configuration of the atom is not appreciably changed by such a substitution, the physical and chemical properties would remain the same. It is only in the case of hydrogen where the external configuration is appreciably changed as we pass to the higher isotopes, and there we also find a slight change in properties. The isotopes of all other elements can be explained in a similar manner, although in the heavier elements there seems to be a tendency to accumulate larger numbers of vortex rings in the individual groups. In other words, in the heavier elements the predominant isotope is shifted more in the direction of the heavier isotopes.

In order to account for isotopes under the nuclear theory, we would have to assume that the nucleus acts merely as a point charge, but if it is in effect merely a point charge, then all the specific physical and chemical properties of the various elements would remain unaccounted for. Dr. Carl Anderson, the discoverer of the positron, was therefore entirely correct when he stated a few years ago that the nuclear theory is "a bundle of contradictions."

Beryllium is unique in that it produces more neutrons, when bombarded, than any other element. The reason for this will be apparent from the diagram. The beryllium atom is more slender and therefore more easily broken than the atom of any other element, and almost exactly at its center of gravity, where breakage is most likely to occur, there are two negative protons. When these are knocked out of the atom they will immediately strip one of their terminal vortex rings and emerge as neutrons. It has been found that the neutrons which are produced from beryllium fall into two distinctly different velocity-groups. This is exactly what would be expected because the first neutron would be knocked from an intact atom, whereas the second one would be knocked from an atom which has already been partly broken.

Even though the nuclear theory may have been partially successful in furnishing a physical background for the mathematical verbiage of the professional physicists, it will never be accepted as final by the thoughtful student of modern science as long as it can offer no explanation whatever for those properties and phenomena which are obvious and well-known to everybody. There is probably no physical or chemical property which we are more concerned with in everyday life than the physical states of the various elements. For example, why is carbon a refractory solid, while nitrogen, immediately after it in the periodic table, is a gas? No amount of juggling with Schrödinger's wave equation will give us the reason for this simple fact, whereas under the vortex theory the reason for it is obvious.

As we pass along the series of elements: Li, Be, B, and C, the central helium group becomes more and more covered up by hydrogen groups. Now helium is an inert gas and the presence of exposed helium groups in the periphery of an atom should tend to keep it in a fluid (liquid or gaseous) condition, whereas the hydrogen groups constitute valence bonds and tend to keep the atoms connected to each other. Consequently as the helium groups are gradually covered by hydrogen groups, the melting points should become higher. This is actually the case. Lithium with its helium groups exposed on three sides melts at 180 degrees, beryllium with its helium group exposed on two sides melts at 1300 degrees, boron with its helium group exposed on one side melts at 2500 degrees, and carbon with its helium group exposed on no side remains solid up to about 4000 degrees. Of the ninety-two chemical elements, carbon is the only one (besides hydrogen) which has no exposed helium groups. This explains why carbon is the most refractory of all elements.

Next we come to nitrogen which is a permanent gas. Why this sudden change? The reason is that nitrogen, and the elements immediately after it, can form diatomic molecules with helium groups on the outermost portions thereof so as to ward off interference with the hydrogen groups near the center. Since oxygen has one more peripheral helium group than nitrogen, flourine has one more than oxygen, and neon one more than flourine, we should expect the melting point to go down, step by step, along this series. This is actually the case. Nitrogen melts at —210 degrees, oxygen at —220 degrees, flourine at —233 degrees, and neon at —249 degrees.

Nuclear physicists will probably say that this is merely a chance coincidence, but let us see what would be the **probability** of such a chance coincidence. A series of eight different values can be arranged in factional eight different ways, and factional eight is 40,320 — yes, exactly **forty thousand three hundred and twenty!** Let nuclear physicists put that into their pipes and smoke it! Out of the 40,320 possible ways in which the melting-points of the first eight elements can be arranged, there is **only one** arrangement which corresponds to that of the known chemical elements, and that is the very one which this vortex theory requires. Nor is that all. The vortex structures have been worked out for about the first eighteen chemical elements, and the same agreement between melting points and atomic structures has been found throughout all. Now factorial eighteen is — (let nuclear physicists, who like to predicate everything on mathematics, give us the answer.)

Nevertheless, the reader will probably reply that "surely there must be something wrong with this vortex theory, for otherwise our scientific magazines would adopt it." The answer to this is quite simple. There never has been any important advance in scientific thought which did not meet with antagonism by contemporary celebrities. Although Isaac Newton spent his entire lifetime trying to establish his theory of gravitation, there were only about twenty people, at the time of his death, who agreed with him. Dalton and Higgins were continually opposed by the savants of their day when they tried to

put across their atomic theory. And everyone knows what sort of horse-laughs Louis Pasteur had to face when he tried, for the first time, to present his germ theory of disease to French scientists. Is it at all surprising then, that our own scientific magazines have turned up their noses at this new vortex theory?

The foregoing proofs of the vortex theory seem so conclusive that it would appear to be wholly superfluous to present any more. However, the best proofs are yet to be presented. There is a certain substance called "diborane" which can be easily produced in the laboratory. Its molecule consists of two boron atoms and six hydrogen atoms. This is an experimentally established fact which has been verified on innumerable occasions and is not questioned by anybody. Now the boron atom under the nuclear theory has only three valence electrons, whereas diborane, under the nuclear theory, would require boron atoms with at least four. Not even the mathematics of Einstein can make three plus three equal eight!

Under the vortex theory, as the diagram shows, diborane can be accounted for without the slightest difficulty. (Since the diborane molecule is a ring-shaped structure, it had to be cut open and spread out into the plane of the paper. Hence the slanting dotted lines.)

On page 996 of the June 12, 1937 issue of NATURE there appeared an editorial in which the author's remarks about diborane were ridiculed, because, according to the writer of that editorial, the diborane problem was "brilliantly solved" in an article on "Hydrides of Boron" in the Feb. 27th issue of NATURE. The article referred to may have been brilliant, but it was not a solution of the problem. It only presented certain evidence to show that diborane should be regarded as an unsaturated compound like ethylene, and not as a saturated compound like ethane. If that be true, then the diborane problem, insted of being "brilliantly solved," was only made worse, because an unsaturated diborane would require more valence electrons on the

ane.

Two diagrams of the carbon atoms are presented. One of them shows it spread out flat, while the other one shows it buckled the way it actually exists in space. If we begin with it in the flat form, and label the four peripheral hydrogen groups A, B, C, and D, then it will be readily seen that it can be buckled in two different ways so as to produce the two asymmetric forms which we meet with in optically active compounds. Now there are certain phenomena like the Walden inversion, racemization by ganism, which seem to indicate that under certain conditions the carbon atom should be capable of passing directly from one enantiomorphic form to the other, without severing any of the valence bonds. This is exactly what would result from such buckling. The clearest example of this is racemization by heat. If such buckling could not occur, then racemization could occur only by actual severence of the valence bonds, and if the heat were intense enough to break the valence bonds, then other chemical changes would take place at the same time.

It will be seen from the diagrams that two of the valence bonds of the carbon atom are slightly different from the other two. This is in agreement with experimental facts. See CHEMICAL REVIEWS, Vol. 7, page 189, (1927).

(To be concluded)

OUR UNIVERSE

(Continued from page 63)

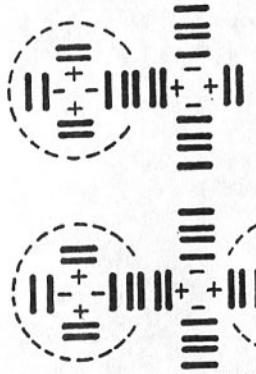
Most of the planets have satellites, our own moon is an example.

Other inhabitants of the universe are the comets. These are probably gaseous balls that wander around through space.

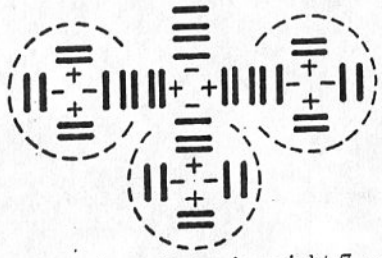
Meteors, once parts of comets, are scattered throughout space.

These are the most important inhabitants of the universe, though others could be mentioned.

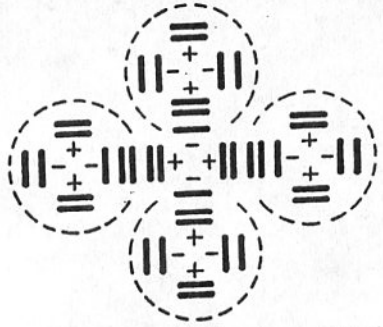
(This is the second of a series of six articles. The third will discuss our immediate neighbors, the planets.)



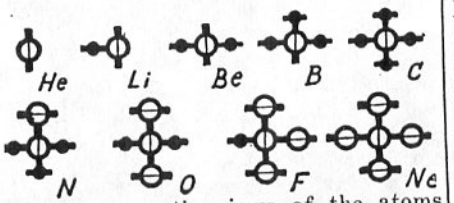
Lithium atom (above) and Beryllium atom (below), atomic weights 7 and 9, and atomic numbers 3 and 4, respectively.



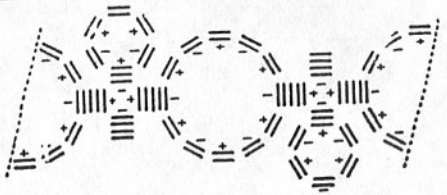
Boron atom of atomic weight 7, and atomic number 5.



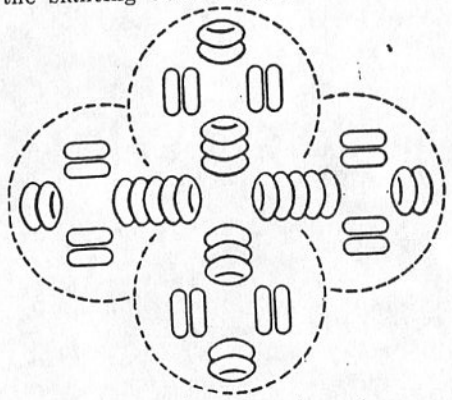
Carbon atom of atomic weight 12, and atomic number 6.



Diagrammatic views of the atoms of the first horizontal row of the periodic table.



Diborane molecule, $B_2 H_6$. Since this is a ring-shaped structure, it was necessary to split it open and spread it out flat to show it clearly — hence the slanting dotted lines.



Perspective view of carbon atom.

CURRENT SCIENCE NOTES

Round Trip To The Moon?

A new and interesting book entitled "Zero to Eighty" has appeared with the prominent electrical scientist, Dr. Edwin F. Northup as author. It is an account of the adventures of one Akkad Psuedonman who travels around the moon. The book is quite readable and at the same time contains within it a considerable amount of technical data. Dr. Northrup believes and states in his book that by using an electromagentic gun consisting of a long hollow coil of wire in which is flowing a variable amount of alternating current a hollow metal sphere could be shot around the moon. For purposes of navigating the craft rocket motors could be used. This book is something a bit different from the ordinary and is recommended as a fascinating volume for the reader.

The broad lines on the surface of the planet Mars are probably strips of vegetation bordering streams.

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THE NEW VORTEX MECHANICS

(CONCLUDED)

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CARL F. KRAFFT

MOLECULAR nitrogen remains inert towards most other elements, even at high temperatures, whereas molecular oxygen is one of the most reactive substances known. The nitrogen molecule must therefore be a much more stable structure than the oxygen molecule. Under the nuclear theory the only difference between the nitrogen and the oxygen atoms is that the former has five outer electrons whereas the latter has six. Why the molecules of the former should be more stable than the molecules of the latter is something which nuclear physicists have not yet explained. Dr. Irving Langmuir tried to explain it when he presented his "octet" theory in 1919, but his explanation was so unsatisfactory that it is no longer seriously urged today. Since nuclear physicists themselves have abandoned Langmuir's attempted explanation, it will not be necessary to go into it in detail here.

Under the vortex theory the nitrogen atom has only three valence bonds. These are at the corners of a tetrahedron, with a helium group at the fourth corner. When two such nitrogen atoms are united through a triple bond to form a molecule, the valence bonds will be near the center of the molecule where they will be guarded against attack from the outside by the helium groups at the extremities of the molecule, which will swing around like dumb-bells to ward off interference. In the oxygen molecule the conditions are entirely different. Each oxygen atom has two peripheral helium groups, and in the oxygen molecule their arrangement is such that the helium groups of one atom will continually bump up against the heliup groups of the other atom, in opposition to the binding effect of the valence bonds. The oxygen molecule is therefore more easily broken up by attack from the outside than the nitrogen molecule.

The tetrahedral form of the nitrogen atom is also corroborated by the isomerism of unsymmetrical oximes, diazo compounds, and hyponitrous acid, each of which occurs in two different forms with slightly different physical and chemical properties. Such isomerism is exactly what the vortex theory requires, whereas under the nuclear theory it cannot be explained. The three valence-electrons of the nuclear trivalent nitrogen atom would distribute themselves uniformly about the center of the atom. The fact that the three valence bonds all crowd over to one side proves that there must be something on the other side, (i. e. the peripheral helium group,) to push them over. Nuclear physicists will probably say that there are still the fourth and fifth valence electrons, and that these may be responsible for the crowding of the first three to one side. It would seem more probable, however, that such fourth and fifth electrons would arrange themselves symmetrically at the poles. If they would remain together on one side, then they would be in very vulnerable positions in the nitrogen molecule, whereas we know that the nitrogen molecule is extremely inert. No matter what sort of [illegible] are [illegible]

THE SCIENTIFIC PRESS

Published Monthly by
The Scientific Press Publishing Co.,
La Porte City, Iowa.

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physicists are in trouble again here, the same as everywhere else. There is only one solution of the problem, and that is the one offered by the vortex theory.

As we pass along any row of the periodic table from the left to the right, there is a gradual change from electropositiveness to electronegativeness. Now electropositiveness simply means a tendency to lose negative electrons, whereas electronegativeness means a tendency to hang on to negative electrons. In any system of atomic structure, it must be the protons that are responsible for the retention of the negative electrons. If these protons are well guarded against attack from outside, then they will be able to hang on to their negative electrons more firmly than if they are in exposed positions. An inspection of the diagrams will show that the protons of the peripheral hydrogen groups are more exposed in the atomic structures on the left side of the periodic table than in the atomic structures on the right side. For example, in the lithium atom the helium group is in such a position that it can offer little if any protection, but in the oxygen and flourine atoms there are additional helium groups at the sides which will swing around the valence bonds and ward off interference. Under the nuclear theory we are supposed to believe that the atoms become more hungry for negative electrons as more of them are crowded into the outer shells — what a piece of nonsense to palm off to the public in the name of the "scientific method"!

At the end of the first horizontal row of the periodic table we come to neon, the next inert gas after helium. The physical and chemical properties of neon are remarkably similar to those of helium. Under the vortex theory there is a reason for this, because the neon vortex atom is composed entirely of helium groups, whereas under the nuclear theory the helium and neon atoms are about as different from each other as any two atoms could be. If peripheral electronic configuration has anything to do with physical and chemical properties, then under the nuclear theory it is carbon and oxygen, rather than helium, which should resemble neon in properties.

It has been found that negative gaseous ions are not formed from neutral molecules, but from positive ions by the addition of two electrons instead of one. (NATURE, July 25, 1936, p. 162.) Under the vortex theory the reason for this is obvious because a univalent positive ion has two regions of positive electrification, each of which would be capable of taking a negative electron. Under the nuclear theory there is no explanation. Negative electrons do not go in pairs, and after the positive ion has been neutralized with one electron, there should be no reason for taking another one.

It has been found that when metallic atoms are bombarded with deuterons, **ordinary protons** are knocked out, and the metallic atoms are converted into their next highest isotopes. (SCIENCE, Sept. 27, 1935, p. 6 of Supplement.) Now where do these protons come from? According to the nuclear theory all protons are supposed to be in the nucleus, and since the nucleus has a strong electropositive charge, the deuterons, which also carry positive charges, should not be able to get anywhere near the nucleus, much less penetrate into it and knock out the protons. Such knocking out of the protons can occur only in the vortex atom where some of the protons are near the periphery.

(Continued on page 75)

OUR UNIVERSE

Russell F. Moore

OUR NEIGHBORS

IN our solar system we have eight neighboring planets. They are, in the order of their distance from the sun: Mercury, Venus, (Earth), Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto.

Mercury is the smallest of the family of planets. Usually it is so near the sun that it cannot be seen. It has no atmosphere and has a surface that is rocky and barren.

Venus is sometimes called our sister planet since it appears to be much like the earth. It has an atmosphere and if any of the planets sustain life it is probable that Venus does. This atmosphere prevents the surface from being studied.

Mars is one of the most interesting of the planets because of the changes that may be observed taking place on its surface. Mars possesses air and water. It is believed that the long "canals" which may be observed on its surface consist of vegetation. The planet is also believed to have snow caps which melt with the seasons.

Jupiter is also interesting because of changing surface markings. It has belts of gaseous matter in its atmosphere which are parallel to the equator. The planet's satellites also present an interesting study. There are nine of them, four as large as our own moon were discovered by Galileo.

The three rings of Saturn constitute its chief attraction. The rings may consist of tiny bits of matter revolving around the planet much as our satellite revolves around the earth.

The other planets, because of their great distance are difficult to study. Powerful telescopes are necessary to find them. It is believed that they consist not of a solid material but of some sort of a gaseous mass.

Someone has suggested that planets even more distant than those now known will some day be discovered. Pluto and Neptune, the last planet to be discovered, were found mathematically first and later in the sky. If Pluto can be observed so that it can be determined that its orbit varies due to the gravitational attraction of some body beyond, then just as in the case of our newest planets, a new planet may be discovered.

(This is the third of a series of six articles. The fourth will discuss the nebular theory of the formation of our solar system.)

CURRENT SCIENCE NOTES

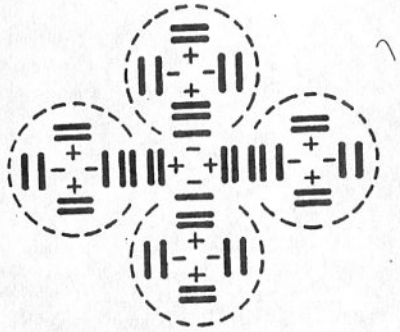
By Russell F. Moore

Sacred cats of ancient Egypt, according to Egyptologists, were fed on fish kept especially for the purpose. The cat symbolized the sun in ancient Egyptian worship.

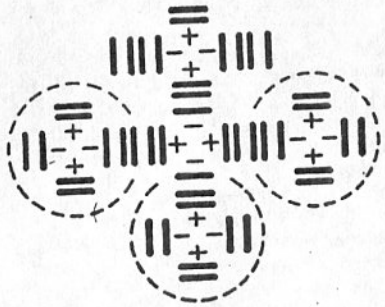
Titanium is used to make thin papers opaque.

At the recent meeting of the American Medical Association at Atlantic City, Drs. R. E. Glendy, S. A. Levine and P. D. White presented an interesting report warning young men in urban districts to "take it easy". Heart disease is liable to be the unhappy fate of many a young man who works too hard, plays too little and eats too much. This disease, usually considered one of old age, has been attacking with increasing deadliness young men. Smoking, and poor sleep habits may play an important part in bringing on this disease according to the doctors.

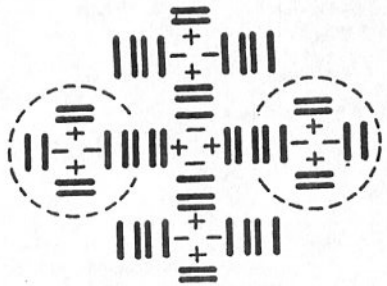
If someone asked you what a "Nuremburg egg" was, you might suspect that he was a biologist, but you would be wrong. A "Nuremburg egg" is a very old watch. In fact, it is one of the first. A mechanic, Peter Henlein made little clocks that would fit into the pocket. They were so nearly round that they earned their nickname.



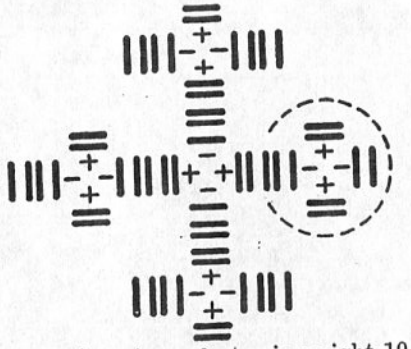
Carbon atom of atomic weight 12, and atomic number 6.



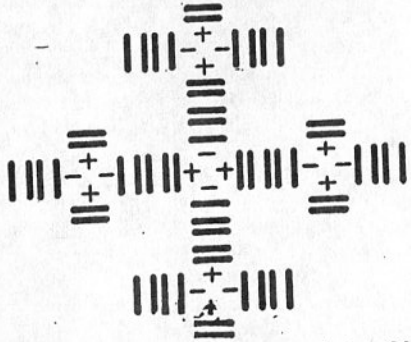
Nitrogen atom of atomic weight 14, and atomic number 7.



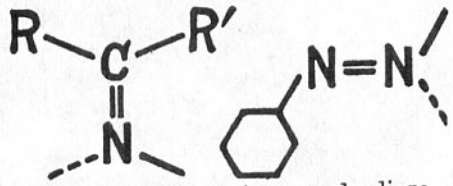
Oxygen atom of atomic weight 16, and atomic number 8.



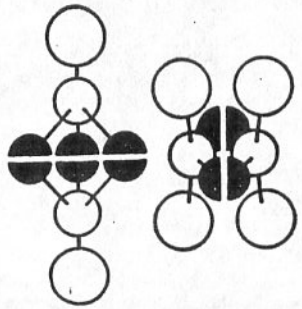
Flourine atom of atomic weight 19, and atomic number 9.



Neon atom of atomic weight 20, and atomic number 10.



Isomerism of oximes and diazo compounds.



Nitrogen and oxygen molecules.

THE NEW VORTEX MECHANICS

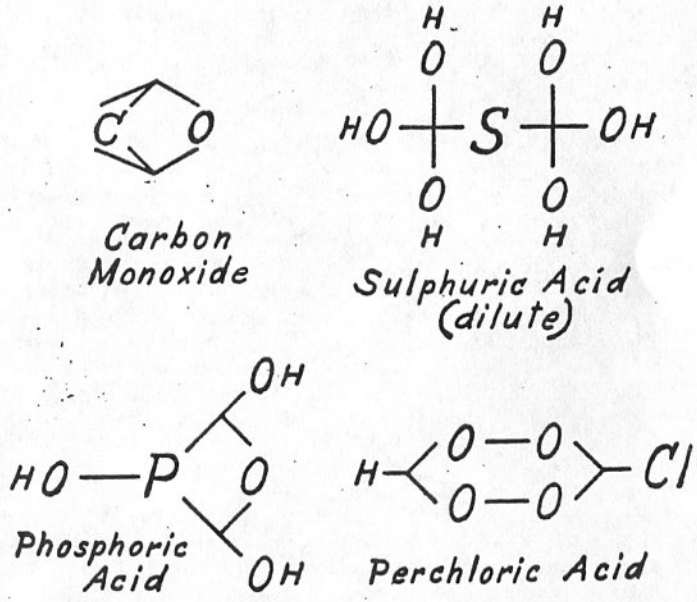
(Continued from page 70)

Electron pairs, consisting of an electron and a positron emerging from the same spot, may be attributed to collisions between negative electrons. If the collision occurs in just the right manner, then two of the vortex rings may form a positron, and the two remaining vortex rings a new negative electron.

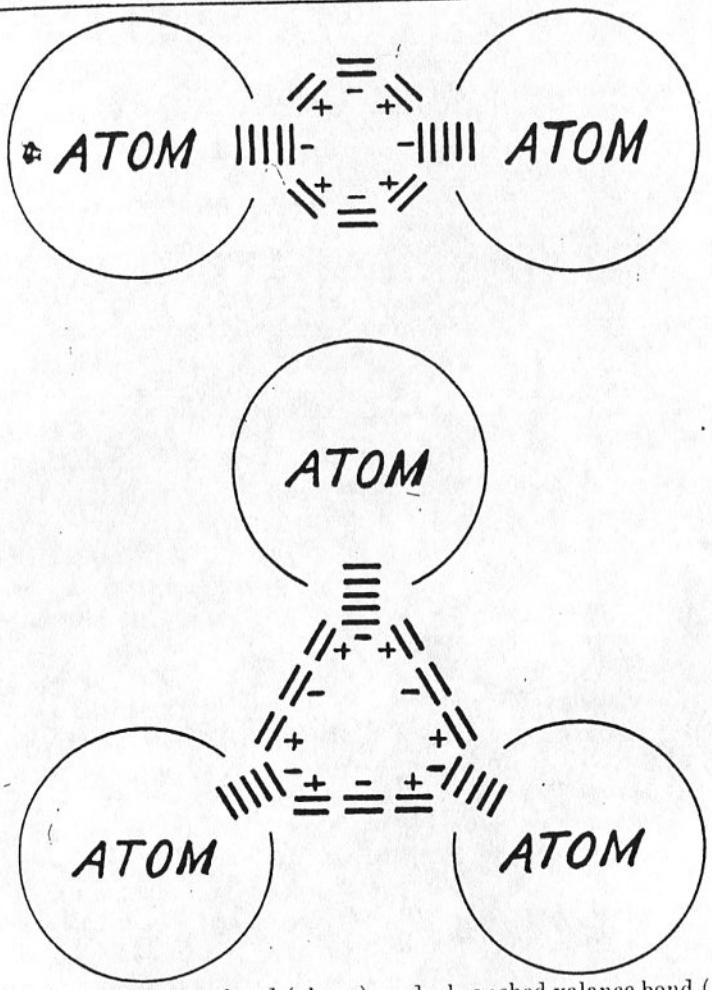
The nuclear theory dogmatically assumes that a valence bond can form a junction between only two atoms, which necessitates fantastic assumptions as to higher valencies of elements like sulphur and chlorine. In the vortex theory such higher valencies are entirely eliminated by the branched valence bond, whereby three or even four atoms can be connected at a single junction. The branched valence bond also eliminates the necessity for "residual valencies", and accounts for certain puzzling cases of unsaturation like carbon monoxide.

Dipole hydrogen bonds (SCIENCE, Jan. 10, 1936, pp. 21—24) are also accounted for under the vortex theory more readily than under the nuclear theory. In fact, ALL valence bonds in the vortex theory are really hydrogen bonds, whereas under the nuclear theory a proton midway between two fixedly positioned electrons would be in unstable equilibrium.

Direct quantitative proof of the vortex structure of the electron has been furnished by recent measurements of the electron wave-length. It has been known for some time that electrons produce diffraction fringes similar to those of light-waves, but of much shorter wave length. Recent measurements in the Bell Telephone Laboratories have shown that the electron wave-length is about 1/18 of an Angstrom unit. Now according to the vortex theory an electron consists of two closely adjacent vortex rings, and careful measurements of the atomic diagrams will show that the distance between successive vortex rings, as measured between centers, is about the same as the experimentally determined value of the electron wave length.



Familiar compounds with branched valence bonds.



The usual form of valance bond (above), and a branched valance bond (below)

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The Scientific Press

—A Bulletin of the Latest Scientific News—

Volume 1 NOVEMBER, 1937 Number 11

OUR UNIVERSE

RUSSELL F. MOORE

SINCE the earth is to us the most important immediate object in the universe it should be interesting to venture a few notes on its origin.

Perhaps the first man to attempt to solve the riddle of the earth's origin was the writer of the book of Genesis who said, "In the beginning God created the heaven and the earth." To many people this explanation is sufficient but to the scientist who realizes the insignificant part our system still plays in the universe it is not.

Kant, in 1754, advanced the first scientific theory to account for the origination of our system. He believed that the earth and its sister planets must have sprung from a single mass. He believed this mass to be similar to the great nebulae beyond the Milky Way.

Some years later the French scientist, LaPlace advanced a theory that was essentially the same as that of Kant. LaPlace believed that the earth was once part of a great heated nebula. Contraction caused it to assume the shape of a ball, which resulted in a huge ball surrounded by a ring of gaseous material. Soon this ring was flung off to form a planet, another ring was formed and likewise flung off until we have the solar system as it is today. This nebular hypothesis reigned until the 20th century when two scientists of the University of Chicago introduced a new theory that did not have the many weak points that the nebular hypothesis had.

In the early days of the twentieth century a new theory of the formation of our portion of the universe was advanced by Moulton and Chamberlain of the University of Chicago. According to this theory our planet along with the others was formed when a visiting star came too close to the sun and raised huge tidal waves on its surface. A portion of the tide was separated from the surface of the sun. These broken-off bits formed planets, these newly formed planets increased in size by collecting smaller bodies, or planetisemals. According to this hypothesis then the earth did not attain an atmosphere until it had grown large enough to accumulate one. Then with an atmosphere, and water, life could begin.

The planetismal hypothesis has been modified by Jeffrys and Jeans who offer the tidal evolution hypothesis. This modification is generally accepted as being the best explanation yet offered.

This hypothesis has stood the test

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Edited by CARL F. KRAFFT

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Volume 1 DECEMBER, 1937 Number 12

World-Ether and World-Riddles

By DR. HERMANN FRICKE, of Berlin

(From Natur und Geist, August, 1937, translated by C. F. Krafft)

HAECKEL in his "World-Riddles" has set upon a comprehensive program for a modern scientific interpretation of the world. Philosophers on the other hand believe that they are still far remote from any "solution" of that riddle. Thesis and antithesis are still standing in adamant and irreconcilable opposition. On the one side stands materialism and mechanism, supported by the Galileo-Newtonian physics and astronomy — on the other side idealism and accultism, supported by experiences of the inner consciousness and by religious tradition.

I believe, now, that I can offer a solution. Nature and spirit are united in the old doctrine of the world-ether. Haeckel has already clearly recognized the significance of the same, and in the XIIth chapter of his "World Riddles", which deals with the laws of matter, has given detailed consideration to the same.

In the meantime, however, the ether theory suffered the great crisis which was brought about by Einstein and the relativity theory. Mysticism spread over everything, and even led to an abolishment of the ether. Nobody seemed willing, any longer, to believe in any simple solution of the problem. The usual endless discussions of this subject, however, do not benefit the reader. I would like to develop here only a simple solution, and show that "world-riddles" can be solved.

In contrast to the usual methods of the professionals, who, like the scholastics or theologians, arrive at their conclusions by deduction from sc[illegible]ory. I employ the inductive method. The latter is employed by all discoverers and inventors — they work not only along with the knowledge of their profession, but enlarge it by their constructive talent and imagination as is commonly done for example in criminology, and, in fact, in "riddle-solving" of any sort.

In my opinion theoretical physics is built upon two entirely different concepts, of which physicists have not heretofore been clearly aware. Two systems have been trying to crowd each other out, and the abolition of the ether was the result of this unrecognized exclusion-psychosis in science. The first of these systems is the mechanics of Galileo and Newton. In it the world is represented as a large vacant space—only in certain places do we find substance or matter. Of quite different construction is the second system—that of Descartes. The latter asked what was the most important characteristic of a material substance, and found the answer to be its "extension". All other characteristics can be dispensed with in the imagination, but not the occupancy of space. Since it would be absurd to assume that mere nothingness could have spatial extension, Descartes assumed that space itself was substance; mere empty space, the starting-point of Newton's mechanical world-picture, his system did not know. Descartes interpreted the motions of the planets around the sun very differently on the basis of ether-streaming, and thus became the first founder of the "ether-vortex the-

ory.

And now the world-riddles, as they were formulated by Du Bois Reymond in 1880 and put into print by Haeckel (8th ed., 1902, p. 18). The first world-riddle deals with the existence of matter and force. Both of these are converted under the ether theory into a unitary substance. Also the puzzling anthesis between substance and empty space disappears. Also the second world-riddle of the "origin" of motion clears itself up. It rests upon the false premise that there exists a condition of quiescence, out of which force can produce motion. In reality there is everywhere only motion — even force and quiescence are conditions of motion—matter at rest being vortex motion.

The fundamental or primordial phenomenon of the world is therefore the indestructible flow of the ether. The ether is space itself—its flow is time. The world is the "flow of time". Now the "normal condition of flow" has been investigated by Rumelin, who has found that flowing substance produces vortical centers which rhythmically change their form —they pulsate. Pulsation is therefore a fundamental phenomenon in physical space—it is however also a fundamental phenomenon of life, of biology. Goethe saw in the pulsating heart the "nucleus" of nature. Now it has lately been surmised that it is not going to be the physical phenomena, (by which was meant principally Newton's mechanics,) but rather the biological phenomena which will henceforth form the basis of our world-picture. In the new ether theory, which we are offering in place of classical mechanics, the fundamental phenomena of physics and biology are already so similar to each other that I do not doubt but what both constitute one and the same thing. "Die Zeit ist eine blühende Flur, ein grosses Lebendiges ist die Natur" (Schiller). At the same time the third world-riddle, the question as to the "origin" of life, is also cleared up. There exists only that which is alive, just as there exists only that which is in motion. Everything that is dead is only apparently dead. And in consequence thereof the remaining world-riddles — the purposiveness of nature, the appearance of sensation and consciousness, the origin of thought and speech, the freedom of the will — no longer appear quite so mysterious.

Haeckel writes: "The monistic philosophy will eventually recognize only a single, all-comprehensive world-riddle, the 'substance-problem'." The ether manifests itself to us as substance — as matter, energy and mind. Its movement confronts us as time, radiation, forces, thoughts and sensations. Just as water does not flow only in the water-pipes of our houses, so thought does not flow only in our brains. Materialism and idealism are at their bases only different research procedures, and as such are both justifiable, each in its own right — the one deals more with observations upon substances, the other more with phenomena of consciousness and experience with human beings.

Of course every solution of the world-riddles leads, in turn, to other riddles. That is a thing for itself. Enormous is the world of the unknown — it is as large as "empty" space. Newton suggested that "Space is God". The concepts: world, ether, substance, nature, mind, and God, from Goethe's viewpoint, become one and the same thing.

I believe that a way has really been found here in which world-riddles can be solved. My article, 'Das neue Weltbild von der kalten Sonne", shows how fruitful this method is, and "by their fruits ye shall know them." The herein presented solution of the ether-problem deserves further elaboration in physics, astronomy, and above all in philosophy. But most professional physicists, upon whose decision it immediately depends, have argued themselves into a totally erroneous conception of the ether. Even the word "ether" has been weeded out of the textbooks. From these professionals there cannot be expected much in the near future. My personal views in regard to this puzzling behavior of physicists have been given expression in the "Deutschen' optischcen Wochensch-

(Continued on page 88)

Protein Chemical Structure

Copyright 1937 by Carl F. Krafft

CARL F. KRAFFT

IN the August issue there was presented a new spiral form of protein chemical structure — a combination of diketopiperazine and polypeptide structure, in which adjacent spirals were connected through oxygen atoms and hydroxyl groups. This structure will now be developed further on a larger scale, in an effort to show that the properties of fibrous proteins, and especially the results of X-ray diffraction studies, can be satisfactorily accounted for on the basis of such a structure.

In the August issue it was shown that closely adjacent polypeptide chains can be connected in only two ways — either through oxygen atoms or through hydroxyl groups — and it is encouraging to know that there are at most only a few different types of lattice-structure which are geometrically possible with these connecting links. In fact, there seems to be only one type which is entirely free from any difficulties, and that is the arrangement shown in the diagrams in which the polypeptide spirals or diketopiperazine rings are represented by polygons or broken lines, and only those oxygen atoms and hydroxyl groups which form connections between adjacent spirals are represented by their usual symbols.

In plan view the structure is made up of a cluster of rectagular compartments, measuring about twice as much in one direction as in the other. This is in perfect agreement with the results of X-ray diffraction measurements, for W. T. Astbury tells us that "two spacings of roughly 4.5 A and 9.5 A are typical of protein structure in general, inasmuch as they represent the two principal side-dimensions of a polypeptide chain." (Proc. Roy. Soc. Lond., A 150, p. 535, 1935.)* It will also be observed that the compartments are rectangular and not hexagonal. This is also in perfect agreement with experimental evidence, for Astbury further tells us that "the experiment demonstrates **by direct measurement** that these two spacings [4.65 A and 9.8A] are indeed at right angles, just as had been concluded already from indirect evidence." (p. 542.)

The dimensions given in the diagrams are those which have been found experimentally by W. T. Astbury and his collaborators. Since we know quite accurately the distance between adjacent carbon, nitrogen, and oxygen atoms in organic compounds, we can also calculate these dimensions directly from the diagrams, and it will be found that the calculated dimensions are exactly the same as those found experimentally.

There is a significant similarity between the author's protein structure, and the structures usually assigned to starch, cellulose, and chitin. In each of these we find adjacent six-atom rings connected through intermediate oxygen atoms.

The structure shown in the diagram is offered as a substitute for the well-known structure of W. A. Astbury, consisting of superimposed grids of polypeptide chains which in the unstretched condition are folded into a series of pseudo-diketopiperazine rings, open on one side. There are several reasons why Astbury's structure cannot possibly be correct, not withstanding its general acceptance by the scientific world today. For instance, he attempts to bridge over the lateral spaces of 9.8 Angstroms between main-chains by means of hydrocarbon side-chains (usually designated as "R"). Now chemical analysis of the hydrolytic cleavage products of silk fibroin shows that the groups R of that material consist almost entirely of hydrogen atoms or methyl groups, which are much too

small to bridge over the distance of 9.8 Angstroms. But even if adjacent main-chains were connected by hydrocarbon side-chains of some sort, then upon hydrolytic decomposition of the protein the peptide linkings would be ruptured long before the side-chains would be attacked. The decomposition products should then consist almost entirely of dibasic diamino acids, whereas with the exception of cystine, such acids have been found, if at all, only in negligible quantities.

Another fatal objection to Astbury's system is that a polypeptide chain could not pass from the stretched configuration into the folded configuration, as he has illustrated it, without rotation of some of the atoms in the main-chain through angles of 180 degrees, and the side-chain connections would prevent such rotation. And furthermore a series of superimposed grids that are only loosely connected to each other would give the protein a laminated structure similar to mica, which proteins do not possess.

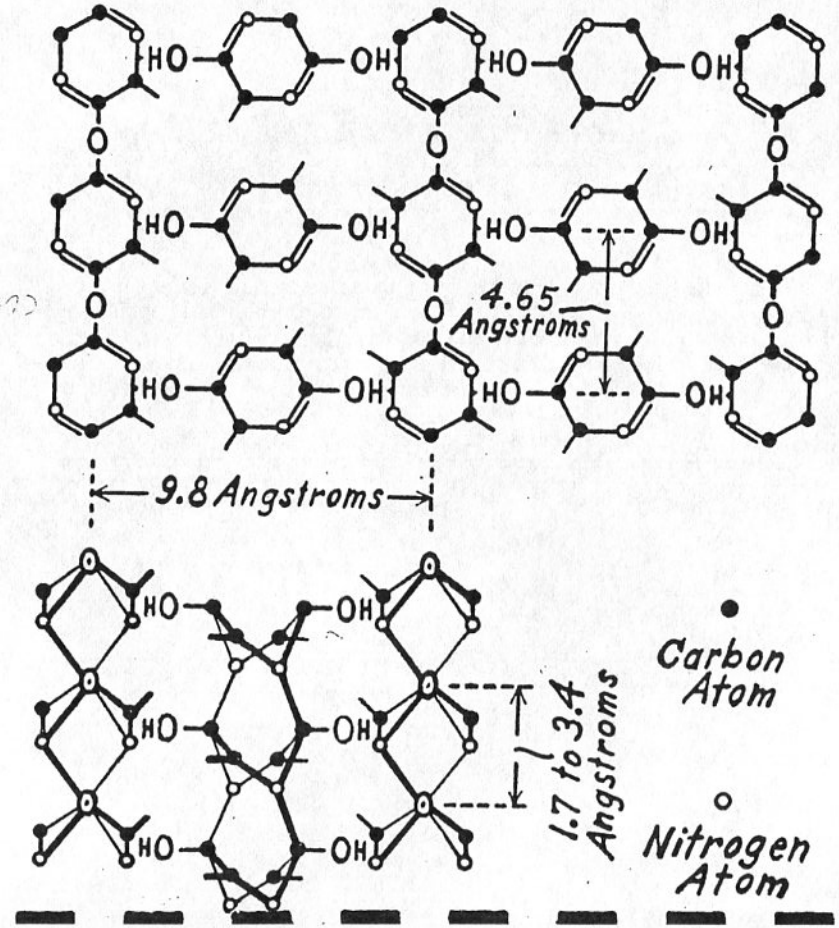
The structure herein presented is intended primarily for the fibrous proteins (e. g. silk fibroins, keratin, myosin, collagen, etc.) Whether this same structure is also present in globular crystalline proteins like egg albumin, hemoglobin, edestin, insulin, and pepsin cannot be definitely decided now. Astbury tells us (**supra**, p. 549): "There would appear to be a great gulf between the molecular structure of feather keratin and that of crystalline pepsin, yet — unless this is nothing more than a remarkable coincidence — the X-ray photograph of the former reveals a striking analogy with that of the latter. **The principal longitudinal and lateral periodicities found in the structure of feather keratin are in close relation to the corresponding periodicities of unaltered crystalline pepsin.**" The same identity intervals of approximately 4.5 and 10 Angstroms occur in both fibrous and globular proteins, and they both exhibit substantially the same chemical properties.

It is also necessary for an intelligent interpretation of biological processes to assume that the protein constituents of fluid protoplasm have a fibrous, and not merely a globular constitution. In his article, "On the Structural Framework of Protoplasm" (SCIENTIA, July 1, 1937, p. 7) A. R. Moore states: "Since protoplasm, as distinguished from nucleus, is endowed with specific characters it seems reasonable to suppose that they have a structural basis, and that living matter is a more ordered and complicated thing than a chaos of particles in a fluid matrix such as an emulsion or suspension.....The dynamic facts require building stuff with directional possibilities, the forerunners of structure. We may suppose that the protoplasm contains polar particles or chains of molecules, which, when occasion requires, link themselves together to form structures, in somewhat the fashion in which micells of cellulose are joined together to form a cell wall."

Similar arguments were presented by the author when he introduced the fibrous theory of protein chemical structure in 1927 for the explanation of growth and heredity (Spiral Molecular Structures, the Basis of Life). Prior to 1927 it was thought that protein molecules were complex beyond comprehension, and that it would be folly, if not heresy, to attempt any sort of structural representation thereof as a mechanistic explanation for life processes. The author, however, was convinced that nature could never have produced life spontaneously if an extremely complex mechanism were necessary for that purpose. On the contrary, he took the position that "It seems more reasonable to assume that life is due to some comparatively simple principle of chemistry which has not yet been discovered." (p. 2.) This new principle was then shown to be the perpetuation of specific patterns in fibrous chemical structures: "The simplest living bacillus is about a thousand times larger than an individual polypeptide spiral, and very likely consists of large numbers of such spirals in parallel formation, either as a solid rod or as a hollow cylinder.....The arrangement and spacing of the different spirals will be subject to a certain amount of variation, depending on the nature of the molecular complexes which connect them, but whatever the arrangement is, it must necessarily be maintained throughout growth, and will, upon division, be transmitted to the progeny by a process of heredity." (p. 5.)

It is inconceivable how heredity or self-perpetuation, which is essential to all life processes, can be accounted for on the basis of anything except a fibrous structure, and since we know of at least one crystalline or globular protein (tobacco leaf virus) which does exhibit heredity and self-perpetuation, we are compelled to assume that a fibrous internal structure is present in at least some of the globular proteins.

In opposition to the fibrous theory of globular proteins, Dr. D. M. Wrinch of Oxford has presented a "cyclol" theory (NATURE, June 5, 1937, p. 972) according to which the molecule of a globular protein like insulin consists of a hollow polyhedron, formed by folding up a monomolecular protein film into the form of a hollow shell. Dr. Wrinch has shown that the insulin molecule, according to the cyclol theory, would contain 288 amino acid residues, which is exactly the number that has been reported as having been found by chemical analysis. At first glance this would appear to be conclusive proof of the cyclol theory, but upon further study it does not seem so convincing. The number 288 is merely eighteen times sixteen. A group of nine diketopiperazine rings (a square having three along each side) would, after four successive polymerizations, produce a



molecule with exactly 288 amino acid residues, and experiments with the ultracentrifuge have shown (SCIENCE, April 13, 1934, p. 327) that most proteins do have a strong tendency to polymerize or disintegrate upon change of pH.

Another argument against the cyclol theory of globular proteins is that we have a similar classification of polysaccharides (cellulose, starch, and glycogen) into fibrous and globular varieties, and it appears to be definitely established that the molecules of globular polysaccharides (e. g. glycogen) are branched and not hollow polyhedral structures. (DIE NATURWISSENSCHAFTEN, Oct. 15, 1937, p. 673.)

World-Ether and World-Riddles

(Continued from page 84)

rift", 1937, pp. 190-195. In addition to my book "Die im Innern erdahnlighe Sonne" (Weimar, 1934), and my lectures at the Humboldthochschule in Berlin, I have also instigated the founding of the "Gesellschaft für Weltatherforschung und anschauliche Physik". We are not striving so much for an immediate solid organization, but rather for a getting together and cooperation of all those who are interested in the ether-problem. There is no shortage of the latter; works and calculations which go back again to the astronomy of Descartes have been sent to me by Schrempf, Aldingen (Wurttenberg) and Schauerberg, and Graz. Dr. Ruckhaber, the co-author of the well-known book "Hundert Autoren gegen Einstein", has published a new booklet "Das Atom ohne Electronen" (Damerius, Berlin, 1935), in which he comes out in support of the vortex-atom. He has also arrived at new numerical relationships in astronomy on the basis of Descartes' vortex theory. Dr. G. Lehman makes reference in Heimsoeth's "Blättern für Deutsche Philosophie" (1937, Vol. 1) to the works left by Kant, in which Kant came very close to our solution of the ether-problem. Strehl in Hof has sent us some interesting material on his contrast-theory in which he also opposes Einstein. In America, Carl F. Krafft of Washington, D. C., has introduced a new ether vortex mechanics in numerous publications (e. g. "Life a vortex Phenomenon"). The world-ether, although pronounced dead is still persistently alive. Only vigorous propaganda for the world-ether theory will be able to extricate science from its present-day mystification. With this in mind, my presentation is now concluded with the words which Goethe directed to Eckermann: "And then, one must always reiterate that which is true, because that which is erroneous is also always being preached again, and in fact, not from individuals, but from the masses. In newspapers and encyclopaedias, in schools and universities, everywhere error is on top, and being on the side of the majority, it feels very well and comfortable."

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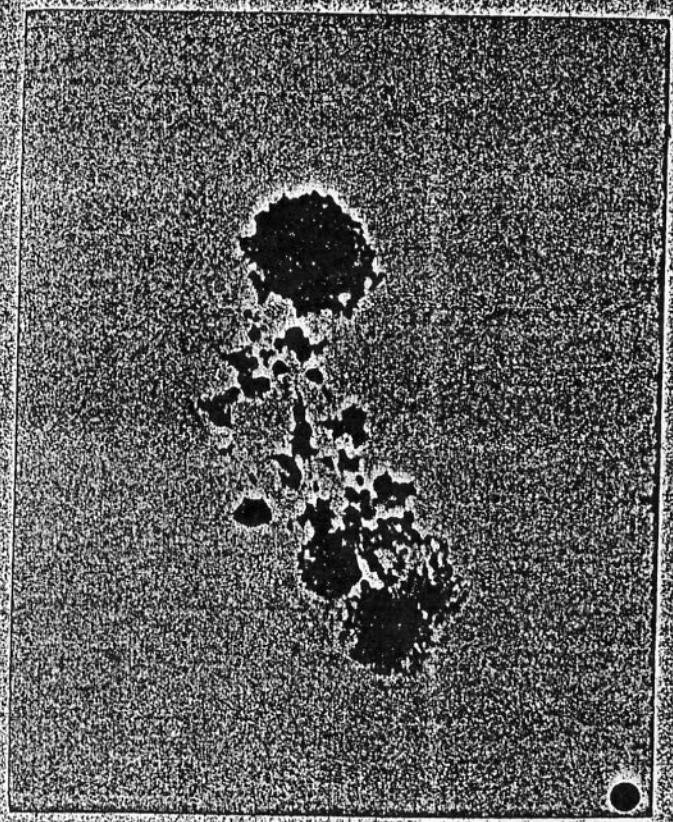
The Scientific Press

January
February 1938

Volume 2
Number 2

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SUN SPOTS

● PROTEIN CHEMICAL STRUCTURE — Krafft

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2 Pages	10.00

Published monthly by Russell F. Moore, Quad. 80-A, Iowa City, Iowa.

Protein Chemical Structure

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CARL F. KRAFFT

IN the August 27, 1937 issue of SCIENCE there appeared an article from Rockefeller Institute, dealing with proteins and enzymes. Considering the source of that article, and the magazine in which it was published, one would expect to find therein a reasonably up-to-date presentation of the subject. Great is our surprise, however, when upon reading the article we find that the material in it is such as would have been out-of-date ten years ago. The writers of that article, without proof or explanation, proceeded with the gratuitous assumption that the entire protein molecule contains **only a single** polypeptide chain. Finding themselves unable to account for the maintenance of individuality on that basis, they then stated that "there appears to be no other choice than to assume that the synthesis of each of these gigantic (protein) molecules is controlled by a specific chemical organizer" which "must have the ability to promote hundreds of consecutive specific reactions" in putting the successive amino acid groups into their proper places in the polypeptide chain, and that "it appears likely that the intracullular proteinases are in reality the protein organizers." They then expressed the opinion that these proteinases were themselves proteins, and that they "have the ability to synthesize replicas of their own structural pattern."

The theory that the entire protein molecule consists of only a single polypeptide chain became obsolete in 1927 when the author explained in his monograph SPIRAL MOLECULAR STRUCTURES, THE BASIS OF LIFE that the protein molecule probably consists of clusters of parallel polypeptide chains arranged according to a definite pattern, and that the "maintenance of individuality" was merely the perpetuation of this pattern. Copies of this manuscript were deposited at the Rockefeller Institute and also in the libraries of all the leading universities, both here and abroad, but even if this monograph was not heeded, the subsequent investigations of proteins with X-rays in which the parallelism of polypeptide chains was established experimentally should have been known of by the writers of that article.

Another interesting feature of that article is that the last half of it contradicts the first half, which may have had something to do with the fact that it had two authors. The underlying idea of the first half is that the protein molecule has no unitary organization of its own and therefore requires another entity, namely an "organizer", for synthesizing it in the living organism. In the last half, however, we are suddenly confronted with the suggestion that this "organizer" may be a protein, which comes as quite a surprise, since we had just been given to understand that proteins cannot organize themselves.

It is now quite definitely established that enzyme molecules are protein compounds or derivatives (SCIENCE, Nov. 26, 1937, p. 479), but this does not mean that they can also operate as organizers of **other** protein molecules. There is no experimental evidence which would justify such an assumption. The mere fact that certain organic chemicals like benzoylglycine and aniline will combine with each other in the presence of an enzyme like papain does not prove that this or similar enzymes can fabricate the complex chemical structures **of other proteins.** Emphasis is here placed upon the word "other" because in the system of protein structure recently published by the author (THE SCIENTIFIC PRESS, Aug. & Dec., 1937) the proteins act as **their**

own organizers. The possibility that a protein may be its own organizer seems to have been totally overlooked by the writers of the aforesaid article. In fact, in the ordinary course of life processes, it is not even necessary for proteins to organize their own structures. It is only necessary for them to **maintain their organization during growth and division** by perpetuation of the same cross-sectional pattern while growth and division takes place in a direction perpendicular thereto. All of this was clearly explained in the author's 1927 monograph, and in several subsequent publications. If the scientific profession would have heeded these, then we would not be confronted today with obsolete and erroneous presentations like the one above referred to.

It cannot be too strongly emphasized that heredity or self-perpetuation is at the basis of all life processes, and that a clear understanding of the significance thereof would greatly clarify many theoretical discussions. Perpetuation of a two-dimensional pattern into the third dimension of space must always be the underlying thought in every explanation of heredity. This proposition was clearly stated in the author's 1927 monograph above mentioned, from which the following is quoted: "The smallest living bacillus ....consists of a large number of such spirals in parallel formation....The arrangement and spacing of the different spirals....must necessarily be maintained throughout growth, and will, upon division, be transmitted to the progeny by a process of heredity." (p. 5.) A similar proposition was stated on page 310 of the Oct. 6, 1933 issue of SCIENCE: "If we suppose our molecule to have a configuration in three dimensions, we still have trouble in imagining how it can build up a similar molecule by its side. Haldane has presented what, so far as I am aware, is the only intelligible picture of how a complex molecule can generate another, by supposing that it is organized as a sort of flat plate so that each atom or radicle might be supposed to attract to it corresponding atoms or radicles, and thus form a new molecule of a similar composition." In view of the importance of this proposition in theoretical biology, it should be definitely determined whether it was first suggested by Haldane or by the author.

It will be seen from the diagrams in the August and December issues of THE SCIENTIFIC PRESS that the protein chemical structure has a kind of polarity very similar to that of a magnet, and in fact consists of a cluster of miniature molecular magnets. It is always alkaline at one end and acid at the other end, and if division occurs, then each of the fragments will possess a similar polarity. Assimilation of amino acid residues probably takes place at the hydrophilic carboxyl ends rather than at the hydrophobic amino ends, but as the hydrophilic ends are not always located on the periphery of the cell, the problem of getting the necessary food matrial to them presents itself, especially when the food is not soluble in the surrounding medium. This difficulty is overcome by the liberation of small fragments or "enzymes" from the living cell, which are then free to migrate out to the food material and make their attack upon it, setting free the individual amino acids. There seems to be no reason for assuming that these amino acids are actually transported by the enzymes into the living cells. In fact, the ability of minute traces of proteolytic enzymes to digest almost unlimited quantities of dead protein material seems to indicate that these enzymes do not remain attached for any length of time to the fragments which they dislodge.

If proteolytic enzymes are broken-off portions from living cells, then they should have an acid-alkaline polarity and a cross-sectional pattern similar to that of the intracellular proteins from which they were derived. If the proteins of the food material have a similar pattern, or one which will permit sufficiently close approach of the enzyme molecules, then a temporary chemical union may be assumed to take place, followed by dissociation and simultaneous dislodgement of some of the amino acid residues from the surface layer of the food material. The enzyme thus acts as an intermediary between the dead food material and the living intracellular protein. It may be considered as having greater affinity for amino acid residues than the dead material, but less than the living material.

In order to account for these differences in affinity we must take into consideration three factors—first the magnetic effect of the polypeptide spirals, second the circulation of the fluid portion of the protoplasm, and third the effect of chemically active side-chains. As explained in the previous articles of the author, the magnetic effect exists wherever the spiral structure is present, but the protoplasmic circulation ceases or changes its character at the time of death. A complete living cell is generally much larger than an individual enzyme molecule, and may be presumed to have a circulatory system very different from that of the latter. In a living cell the circulation may be such as to maintain certain conditions of hydrogen ion concentration in different portions thereof, which would not be maintained in the individual enzyme molecules or in dead protein material, and which may be necessary for enabling living matter to take on amino acid residues at the expense of the dead food material. The responsiveness of proteins to slight changes of hydrogen ion concentration is shown by their tendency to aggregate or disintegrate in the centrifugal field upon change of pH. (SCIENCE, Apr. 13, 1934, p. 327.) In the author's system of protein structure the unidirectional circulation of fluid is secured by the structure itself, since the walls of the rectangular passageways will be covered with numerous side-chains always overlapping in the same direction so as to function like one-way valves. In order to cause the fluid to circulate, it is merely necessary to provide the necessary energy, which may be derived either from sunlight or from chemical reactions like the oxidation of fats or carbohydrates. And lastly the effect of chemically active side-chains is undoubtedly an important factor in any kind of protein metabolism.

Chemically active side-chains are parts of the molecular structure of every enzyme and determine the specificity thereof. Side-chains of one sort or another are attached to all sides of the protein portion of the molecule, but those which are at the amino end are probably the ones which are responsible for proteolytic activity if the enzyme is one which attacks the carbozyl ends of the food molecules. In the pepsin molecule it appears to be the tyrosine group which contributes such activity (SCIENCE, Nov. 26, 1937, p. 482). Although the specificity of an enzyme depends primarily on the chemical structure of some active side-chain, it is the ordinary protein portion which determines the degree of activity.

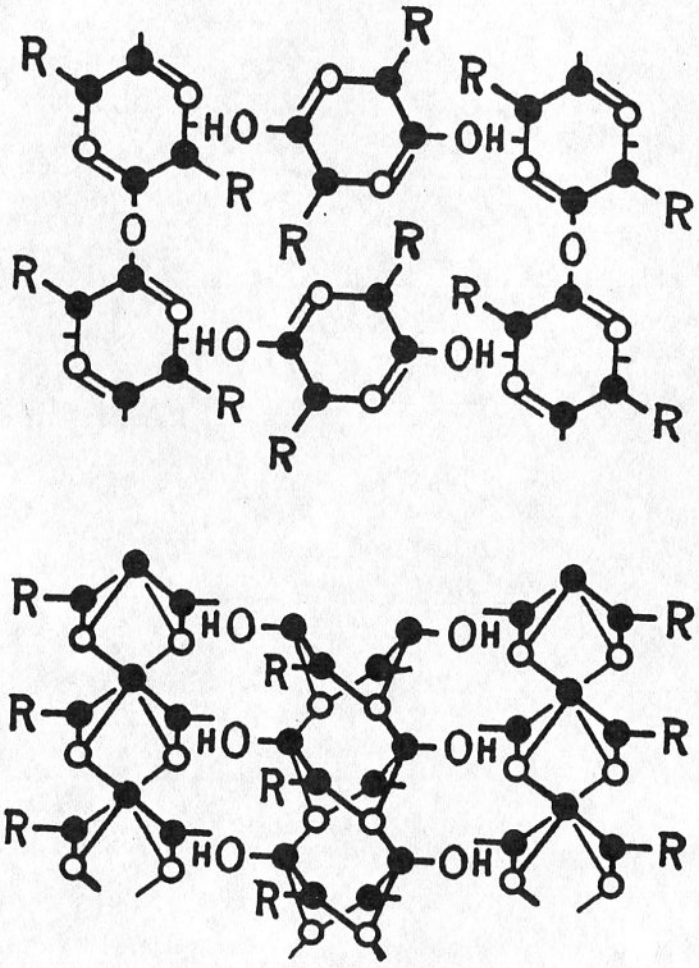
Those who wish to make a further study of the mechanism of proteolytic enzymes should read the article by Max Bergmann in the May 18, 1934 issue of SCIENCE. Experiments with peptidesplitting enzymes have shown that the presence of alpha hydrogen atoms in the amino acid residues, and their arrangement in the cis-position in dipeptides, is essential for the action of those enzymes which attack the carboxyl ends of the polypeptides, although not for those which attack the amino ends. This seems to indicate that in protein molecules the hydrocarbon side-chains (usually designated "R",) are slanted towards the amino ends and not towards the carboxyl ends of the spirals. Heretofore the author has assumed that they project upwardly from the actively growing carboxyl ends so as to have the maximum freedom. However, since these hydrocarbon side-chains are hydrophobic, they will be pressed back toward the other end of the protein molecule by repulsion from the water clinging to the hydrophilic carboxyl groups. In order to ascertain the exact structure with certainty, it would be advantageous to know the actual con figurations of the optically active amino acids and diketopiperazines.

The subject of protein structure should not be concluded without a brief mention of monomolecular films, a preliminary account of which was published in the Jan. 15, 1937 issue of SCIENCE. Most of the experimentation

thus far has been with egg albumin, although it may be expected that many other proteins will show a similar behavior. In these experiments it has been shown that a dry monomolecular film of agg albumin is 20 Angstrom units thick, and is hydrophilic on one side and hydrophobic on the other side. It behaves like a two-dimensional network in which the units are connected by strong elastic springs. All of this is in perfect agreement with the author's system of protein structure. If we accept the recent reports of chemists that the molecule of egg albumin has 288 amino acid residues (JOURN. BIOL. CHEM., 118, 301, 1937), and that they are arranged in groups of 18, then the entire molecule will consist of a cluster of 9 double-strand polypeptide spirals forming two rectangular compartments, each measuring approximately 4.5x10 Angstrom units. Each of these double-strand spirals will consist of a column of 16 superimposed diketopiperazine rings. When the material is thoroughly dehydrated, these may be assumed to be nested closely upon one another, and will then form a column exactly 20 Angstroms long. Since natural amino acids are always of the same optical variety (usually left-handed), it must be assumed that the hydrocarbon side-chains along the sides of the spirals always slant in the same direction, so that the double-strand spirals, and in fact the entire protein molecule, will be definitely hydrophilic at one end (the carboxyl end), and hydrophobic at the other end (the amino end). Consequently when these molecules are all arranged with the same end up, they will form a monomolecular film which will be hydrophilic on one side and hydrophobic on the other side. Furthermore it will be seen from the diagrams in the August and December issues of THE SCIENTIFIC PRESS that such a molecule will have an exposed row of hydroxyl groups along each corner. These will form chemical bonds with the sides or corners of adjacent molecules, there being eight points on the periphery of each molecule where such a bond can be formed. Since the molecules will have a random distribution in the plane of the film, their arrangement will be "smectic" and not crystalline, so as to leave irregular open spaces between them. This accounts for the lateral compressibility of the film.

In an article on page 292 of the Sept. 24, 1937 issue of SCIENCE it was reported that the usual 10 Angstrom spacings of proteins could not be found in the X-ray photographs of these films, but that a longer spacing of about 73 Angstroms was obtained from a series of superimposed films of the type ABAB.....(alternate layers inverted). This is as it should be with the author's system of protein structure. Since the molecules have a random arrangement in the plane of the film, the 10 Angstrom intervals would not appear on the X-ray photographs, but every pair of layers should produce a longer spacing. Since a single film which has been thoroughly dried has a thickness of 20 Angstroms, a pair of films would have a **minimum** thickness of 40 Angstroms. With some residual moisture in the material, a few irregularities in the structure, and some warping and buckling, it would be quite reasonable to expect an actual spacing of the order of 73 Angstroms.

It has been assumed in this article that all proteins have an internal fibrous structure, which would rule out the possibility of truly globular forms. This position was taken deliberately after careful consideration of all arguments in favor of the possible existence of hollow (e. g. "cyclol") molecules. The author agrees with W. T. Astbury that "it looks now as if the original distinction between the two types (fibrous and globular) is beginning to disappear." (NATURE Dec. 4, 1937.)



PROTEIN CHEMICAL STRUCTURE

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Black dots are carbon atoms, and small circles nitrogen atoms. The R's represent side-chains.

The rectangular compartment in the upper diagram measures approximately 4.5x10 Angstroms, which agrees with the identity intervals obtained from the X-ray diffraction patterns of nearly all proteins.

The lower diagram shows double-chain spiral polypeptides formed of superimposed diketopiperazine rings.

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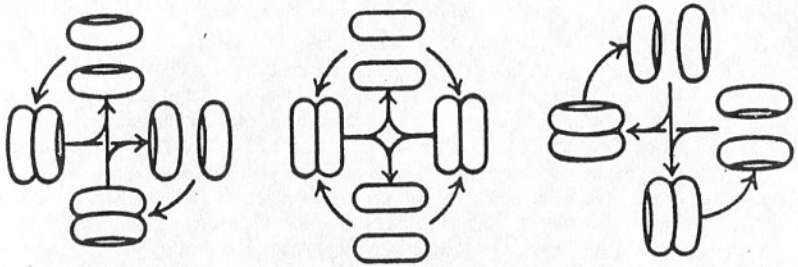
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ORTHOHYDROGEN AND PARAHYDROGEN

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Orthohydrogen Parahydrogen Orthohydrogen

These two allotropic forms of molecular hydrogen, which differ slightly in their properties, occur ordinarily in the ratio of 3 to 1. At very low temperatures and under pressure, and especially in the presence of charcoal, there is a rapid conversion of orthohydrogen into parahydrogen. At higher temperatures the parahydrogen gradually reverts into orthohydrogen until the equilibrium ratio of 3 to 1 is reached.

Can these two forms of molecular hydrogen be accounted for structurally, or is it necessary to invoke mysterious "spins" which do not obey the ordinary laws of mechanics and electrodynamics? Under the nuclear theory it is manifestly impossible to account for them structurally because the nucleated atom has no structure—at least none that can be represented diagrammatically as a plausible picture of physical reality. In the new vortex theory we do have the required structure—a complex system of circulating currents in a quasifrictional ether which should be able to assume different configurations of stable equilibrium.

The hydrogen molecule in the vortex theory consists of two atoms which may be interlinked either by means of their polar flux as in the diagram at the left, or by means of their peripheral flux as in the diagram at the right, or by both as in the diagram at the center. The fact that two different structures are theoretically available for orthohydrogen need not worry us because one

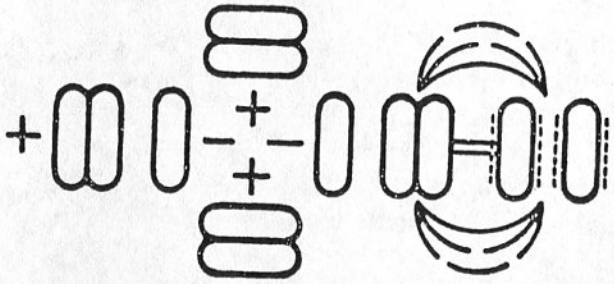
of them may be unstable. It is better to have too many possibilities than too few as under the nuclear theory.

As is clearly shown in the diagrams, the parahydrogen molecule is flat and symmetrical and will retain its symmetry while traversing a magnetic field as in the Stern and Gerlach experiment. The inert gas atoms behave in a similar manner, as might be expected from the stability and symmetry of their atomic structures. On the other hand the orthohydrogen molecule will always be more or less tetrahedral and unsymmetrical so as to exist in two enantiomorphic forms, which will be deflected in opposite directions in a tapering magnetic field. While traversing such a field the protons will be acted upon by a transverse force in one direction and the electrons by a transverse force in the opposite direction. Both the orthohydrogen and the parahydrogen molecules will therefore be drawn into the tetrahedral form, but only the orthohydrogen molecules will be unsymmetrical. Monovalent atoms like sodium behave in a manner similar to orthohydrogen, as might be expected from the resemblance of their valence-bonds to hydrogen molecules.

The two allotropic forms of molecular hydrogen having been thus accounted for on a purely hydromechanical basis, the entire "spin" theory of the new quantum mechanics may be discarded as superfluous. The various structural orientations which are possible in the vortex atom are fully adequate to account for both the fine and the hyperfine structures of spectral lines. In fact, the entire quantum theory will have to be considerably revised because the quantization of energy can now be interpreted as a function of the atomic structure, the "photon" concept being superfluous. Let us not be deceived by the publicity which has been given to some of the ultra-modern concepts of physics. Endorsement by high authorities cannot take the place of proof, nor does universal acceptance make valid that which was erroneous from the beginning. We have wasted enough time on ghost-atoms and hyperspace. Let us return "to the solid ground of nature" and continue the work of Descartes and Maxwell.

ATOMIC OSCILLATORS

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Helium ion with a captured electron

Many efforts have been made to find some simple harmonic relationship between spectral frequencies, but no such relationship has ever been found. It would require an oscillator with a rigid *mechanical* framework which remains intact during absorption and emission of radiation. Such a framework does not exist in the new vortex atom. Its protons and electrons are held in position by a *dynamic* framework consisting of circulating ether currents which increase and diminish during absorption and emission of radiation. Although such a dynamic framework would not produce overtones or harmonics, it should be capable of vibrating in larger or smaller segments so as to produce the successive lines of the spectral series.

* * * * *

In a previous article it was shown that orthohydrogen and parahydrogen are merely two different configurations of stable equilibrium in the hydrogen vortex molecule. Since hydrogen groups are present in all other atoms except the inert gases, it would be reasonable to expect such hydrogen groups to exhibit similar configurations in the atoms of other elements, and this is what seems to be indicated experimentally. For example, the sodium atom is deflected by a tapering magnetic field

in the same manner as hydrogen, but helium and neon are not deflected. Apparently the inert gas atoms exist only in the symmetrical or para-configuration. This is not surprising because inert gas atoms consist entirely of helium groups, and we know that the helium atom is stronger and less flexible than the hydrogen molecule.

The two negative protons of the helium atom carry exposed electrons at their outer ends, and there are reasons for believing that these maintain a strong flow of ether laterally outwards in all directions so as to behave like large disks. In the hydrogen molecule this outward flow of ether from the electrons is taken up by the adjacent protons, whereas in the helium atom there are no protons immediately adjacent the *outer* electrons. The helium atom will therefore be shaped somewhat like two parallel disks, and these will not permit sufficient tilting for the atom to remain permanently in the tetrahedral form.

The fact that the atoms of the different elements produce series of spectral lines very similar to one another seems to indicate that the atomic oscillators of the different elements are likewise of similar constitution. For example, the Pickering series of the helium spectrum is so similar to the Balmer series of the hydrogen spectrum that it was at one time mistaken for the latter. Since the hydrogen atom consists of only one electron and one proton, it must be assumed that the successive lines of the Balmer series represent successive positions of the electron relative to the proton. The helium atom has no *removable* electrons, but we may assume that the two outermost vortex rings of the negative protons can be readily knocked off. This is a reasonable assumption because the energy equivalent of an electron is only 500,000 volts, as against 930 million volts of the proton. The electron is therefore much more easily destroyed than the proton, so that if any part of the helium atom is ruptured, it will be one of the electrons.

Removal of an outermost vortex ring from one of the negative protons will leave the helium atom with an exposed positive charge, so that it should behave similarly to the hydrogen *ion*. If it picks up a stray electron (which may be produced synthetically from the knocked-off vortex rings), then we may expect this electric doublet to behave in a manner similar to the hydrogen atom and produce a similar series of spectral lines. Besides the Pickering series, helium also produces several other series of lines, but these may be accounted for by assuming that the *other* negative proton can also undergo a series of similar transformations. It may simply lose its terminal vortex ring so as to be left with an exposed positive charge, or it may pick up another stray electron which can also assume a series of different positions.

The assumption which has just been made concerning the disintegration and synthesis of the electron is corroborated by the continual formation of negative electricity in the earth. The entire surface of the earth is at all times negatively charged to such an extent that the atmosphere in the neighborhood of the earth is kept under a constant potential gradient of 150 volts per meter. (Scientific Monthly, July, 1935, p. 50.) This causes a continual outward flow of about 1000 amperes into interstellar space, which would completely discharge the earth in a few minutes if the negative electricity were not replenished. It is not sufficient to assume that this negative electricity results merely from ionization of the atoms, because an equal amount of positive electricity would then be left behind. It must result from the actual synthesis of negative electrons out of non-electric material, and the vortex theory furnishes the only available explanation.

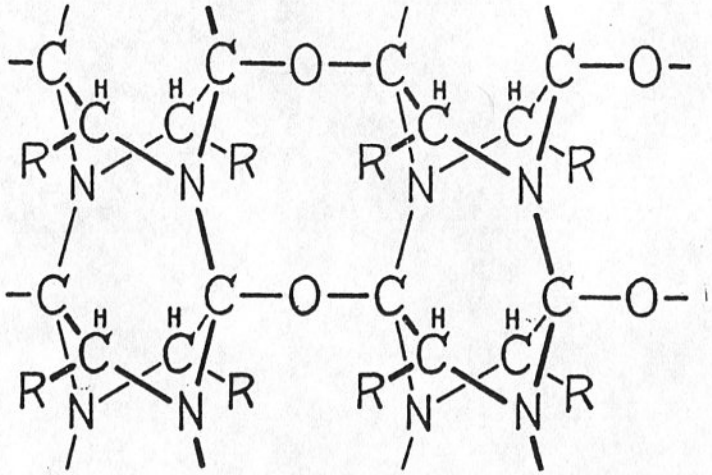
The lithium spectrum would be the logical one to consider next, but to expedite matters we shall pass on to sodium. In order to avoid too many complications at the outset, we shall for the present consider only the spectrum of the neutral sodium atom as produced by the valence-electron, all the helium groups remaining intact. Metallic sodium, when sufficiently heated, produces a monatomic vapor whose absorption spectrum is a con-

verging series of lines, known as the "principal series," each of which represents a transition from one of the abnormal or excited states of the "P" sequence, to the normal state, the latter being the lowest state of the "S" sequence. If a rather good spectroscope is used, each line of the principal series will be found to be a doublet, this being known as the "fine structure." With a still better spectroscope, each line of each doublet will be again resolved into a further doublet, known as the "hyperfine structure." According to nuclear physicists, the principal series is produced by transitions of the valence electron from those orbits which have an angular momentum of $2(h/2\pi)$, to the smallest orbit of zero angular momentum. The latter is supposed to be either a "straight-line orbit," a "spherical cloud of electrification," or a "probability region"—whatever these may mean. In order to account for the fine-structure, nuclear physicists have assumed that the *electrons* can spin on their axes in one direction or the other—but in order to account for the hyperfine structure, they have attributed a similar spin to the *nucleus*. Does it not seem strange that two particles as different from each other as the electron and the nucleus can have the same spinning movement, and with similar effects on the spectral lines?

There are no such inherent difficulties in accounting for the fine and hyperfine structure under the vortex theory. In the vortex atom the peripheral hydrogen and helium groups are joined to the central helium group by elastic swivel connections which will permit these peripheral groups to arrange themselves in any one of several different positions of stable equilibrium, somewhat like the gear-shift lever of an automobile. Since the frequencies of oscillation of the atomic oscillators will depend on the electric fields in which such oscillators are positioned, and since these electric fields are determined by the locations or orientations of the adjacent hydrogen and helium groups, it appears that all the necessary conditions are present in the vortex atom for the production of the fine and hyperfine structures.

PROTEIN CHEMICAL STRUCTURE

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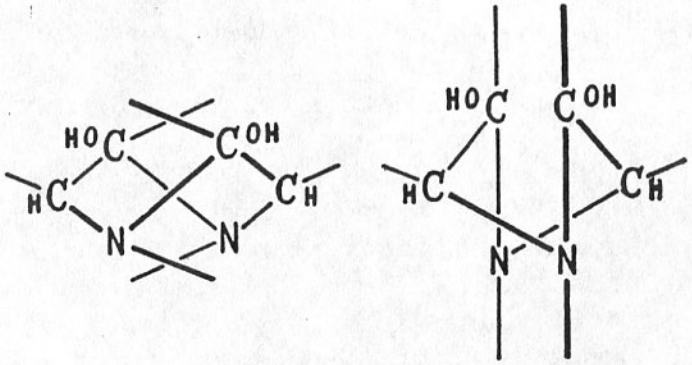
Double-strand spiral system of protein chemical structure

This is a combination of the polypeptide system and the diketopiperazine system. The horizontal identity intervals (distances between spirals) measure 4.5 Angstrom units, while the vertical identity intervals (distances between superimposed diazine rings) measure 1.7 to 3.5 Angstrom units, depending on the amount of stretching. These intervals agree with those found experimentally in the X-ray diffraction patterns of natural proteins. The 10 Angstrom intervals extend perpendicular to the plane of the paper, and therefore cannot be shown in the above diagram. Connections to adjacent structures above and below the plane of the paper are probably made possible by pentavalent nitrogen, or by hydrogen bonds.

ELASTIC DEFORMATION OF PROTEIN CHEMICAL STRUCTURE

(Supplement to *The Chemical Organization of Living Matter* by C. F. Krafft)

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Double-strand polypeptide spiral

Wool fibers in an atmosphere of steam can be stretched elastically to twice their original length, which means that each molecule of the protein of which the fiber is composed must have this same elasticity. The chemical structure of the protein must therefore be such as to permit elastic stretching to twice its original length, but no more. The only explanation which has been recognized is that of W. T. Astbury, who assumes that the polypeptide chains of wool keratin and other proteins are ordinarily folded into diketopiperazine rings with intermediate —CO—CHR—NH— groups, but pass over into the simple zig-zag form when tension is applied. Notwithstanding its general acceptance, Astbury's explanation seems entirely inadequate. The change from the normal configuration (alpha-keratin) to the stretched configuration (beta-keratin) would have to result either from bending of the valence-bonds, or from swiveling about the same. If it results from bending, then we would have to assume that some of the valence-bonds can be bent elastically through 180 degrees, which is unusual

to say the least. Furthermore if they were capable of such bending, then they would be brought into alignment when placed under tension, and not into a zig-zag configuration. On the other hand if it results from a swiveling of the atoms about their valence-bonds, then the side-chain connections to the surrounding structures would be destroyed during such swiveling movement, and furthermore there would be nothing to cause a return to the original configuration upon release of the tension.

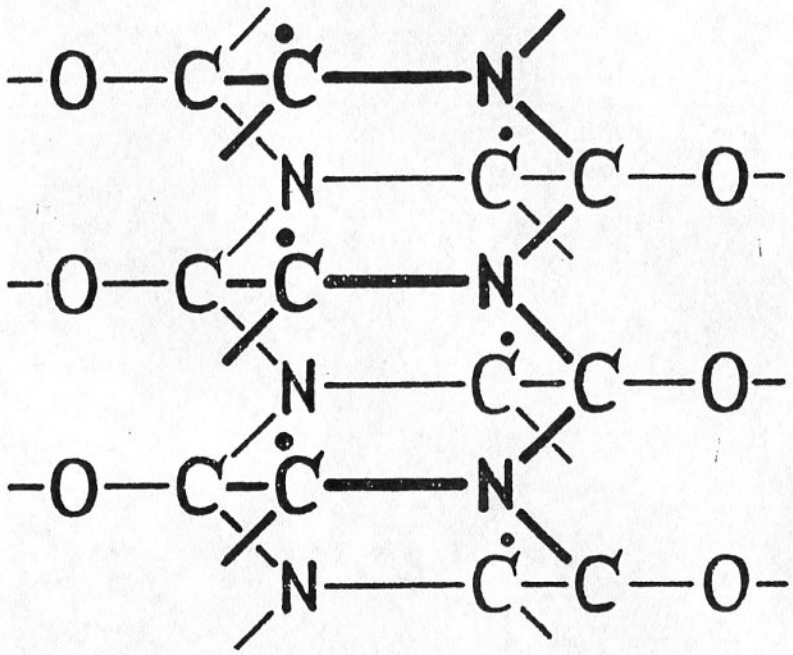
In the double-strand spiral structure these difficulties are entirely eliminated. As the above diagrams clearly show, the spiral structure can be elastically stretched to exactly twice its original length without appreciably changing the positions of the hydroxyl groups by which it is anchored to adjacent spirals.

The spiral structure also accounts for the identity intervals of 3.5, 4.5, and 10 Angstroms along mutually perpendicular axes, such intervals having been determined experimentally for proteins (*e.g.*, beta-keratin) in the stretched condition. Since the 4.5 and 10 Angstrom spacings have already been accounted for elsewhere, it remains to consider only the 3.5 Angstrom spacing. According to W. T. Astbury, this is supposed to be the length of one amino acid residue *when stretched to the breaking-point*. It will be the length of one such residue only as long as the valence-bonds remain at angles of 109 degrees, but there is an abundance of evidence that they can flex through moderate angles and are not rigidly fixed at 109 degrees. In order to account for the transition from alpha- to beta-keratin, Astbury assumes that the valence-bonds can flex elastically through angles of 180 degrees—although in order to account for the length of one amino acid residue, he assumes that they are incapable of any flexing whatever!

In the spiral structure shown in the above diagrams, the 3.5 Angstrom interval represents the distance between successive diketopiperazine rings while the system is under tension as shown in the diagram at the right.

SINGLE-STRAND SIX-SIDED POLYPEPTIDE SPIRAL

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Side view of spiral. Dots represent hydrogen atoms

As long as we do not know definitely in what form the polypeptide chain occurs in proteins, it is advisable to consider all forms that are geometrically possible, especially since there appear to be only two fundamental types—the single-strand spiral and the double-strand spiral.

In these spiral structures it is possible that there may be a slight secondary spiraling in the reverse direction. This is of importance for two reasons: 1st, it would limit the extent over which adjacent spirals can be joined to each other, thus fixing the length of the protein molecule; and 2nd, it would impart a spiral twist to some of the larger structures which can be seen under the microscope.

PROTEIN CHEMICAL STRUCTURE

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The functioning of a system can be understood only when its structure is known. This is as true of protoplasm as of any mechanism. It is also true of chemical reactions. All chemistry is, in the last analysis, stereo- or structural chemistry. It has been customary to place equal value upon structure and constitution, and to regard the dynamics of a system as the result of the interaction between the two, but in reality both are questions of structure, for a specific constitution plays its part only by virtue of a specific structure. Not until the finer structure of protoplasm is known will its many other properties be fully understood. (W. Seifriz, BIODYNAMICA, Jan., 1938.)

There are certain fundamental requirements which must be satisfied by every system of protein chemical structure. Among them are the following:

(1) The structure must be such as to be convertible into optically active amino acids upon hydrolysis. It must therefore consist essentially of polypeptide chains or diketopiperazine rings arranged in some systematic pattern.

(2) It must be self-organizing so as to produce its own structure autocatalytically.

(3) It must be capable of perpetuating extremely complex patterns so as to be able to carry out the process of heredity in the higher forms of life.

Modern theories of protein structure began with the publication of my 1927 monograph, SPIRAL MOLECULAR STRUCTURES, THE BASIS OF LIFE, in which I pictured the protein structure as being formed of polypeptide chains arranged in parallelism and joined to one another by side-chains—an idea which is now generally accredited to W. T. Astbury, although not published by Astbury until several years later.

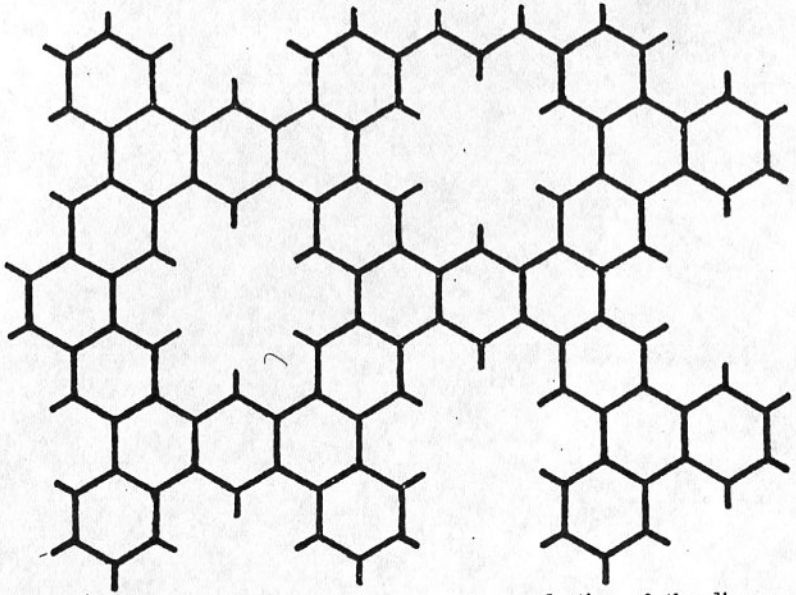
In my 1927 monograph I stated:

"The smallest living bacillus . . . consists of a large number of such spirals in parallel formation . . . The arrangement and spacing of the different spirals . . . must necessarily be maintained throughout growth, and will, upon division, be transmitted to the progeny by a process of heredity."

It cannot be too strongly emphasized that heredity or self-perpetuation is at the basis of all life processes, and must consist of the perpetuation of a two-dimensional pattern into the third dimension of space. This principle, although clearly stated and illustrated by dia-

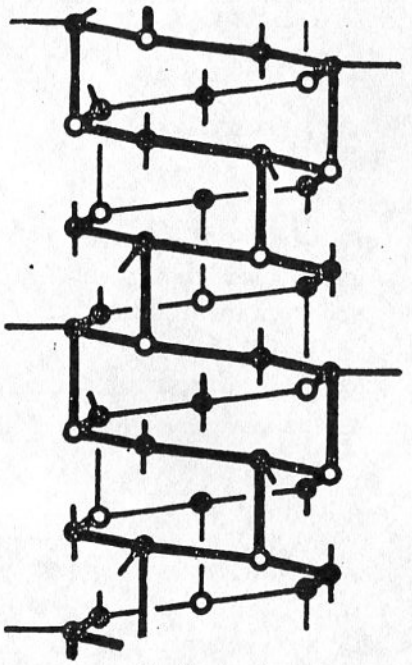
grams in my 1927 monograph, is today generally accredited to Haldane. (SCIENCE, Oct. 6, 1933, p. 310.)

The next important development was the formation of the polypeptide chains into "cyclol" patterns as pictured in my 1931 book, CAN SCIENCE EXPLAIN LIFE?—an idea which is now generally accredited to Dorothy Wrinch, although not published by Wrinch until 1936.

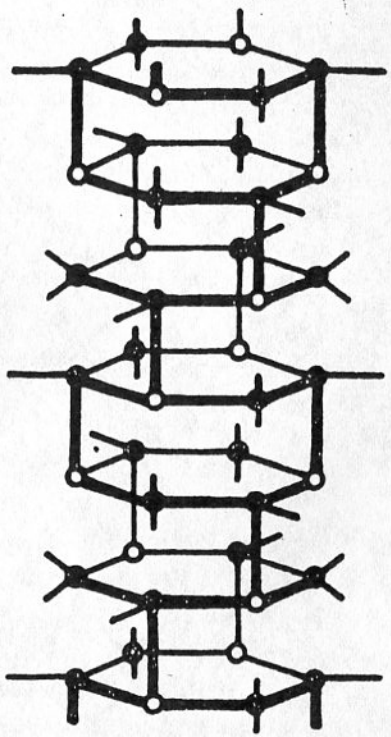


The "cyclol" pattern. This is an exact reproduction of the diagram on page 45 of my 1931 book, CAN SCIENCE EXPLAIN LIFE?, except that it was not called by that name.

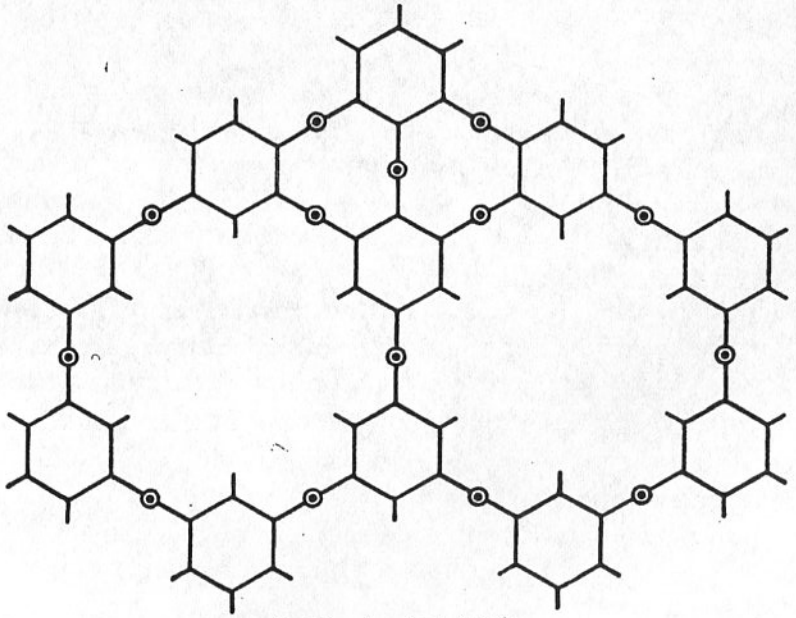
The cyclol pattern gives us only a two-dimensional picture of the protein structure. It tells us nothing about the structure in the third dimension of space. There are three different possibilities: It may consist of flat superimposed layers (Wrinch), or of hollow cages (Wrinch), or of polypeptide spirals arranged in parallelism (Krafft). Superimposed layers and hollow cages fail to account for life processes (growth and heredity) and therefore cannot represent the actual structure of proteins. We know from the behavior of tobacco leaf virus that life processes are functions of the protein molecule, and there are many facts which indicate that all proteins have substantially the same chemical structure. Consequently the only plausible interpretation which can be given to the cyclol pattern is that it represents an end view of polypeptide spirals arranged in parallelism.



Single-strand polypeptide spiral



Double-strand polypeptide spiral



Protein chemical fabric

Large dots are carbon atoms, small circles nitrogen atoms, and circles with central dots oxygen atoms. Adjacent spirals are joined to one another through oxygen atoms.

It is probably safe to say that some form of polypeptide spiral is at the basis of all living matter, because it is quite well established that the spiral structure is prevalent not only in the larger cell-structures which can be seen under the microscope, but also in the finer constituents of the clear protoplasm. (SCIENCE, Feb. 10, 1939, p. 127.)

Cyclol patterns can be formed of either single-strand or double-strand spirals, but only when the successive convolutions of the spirals are not interconnected by secondary peptide links. If they are thus interconnected, as indicated by the vertical lines in the spiral diagrams, then adjacent spirals can be connected to one another only through the oxygen atoms of the carbonyl groups, or through other side-chains.

Experiments with accurately constructed atomic models have shown that if the successive convolutions of the *single-strand* spiral are interconnected by secondary peptide links, then the spiral will probably have *seven* atoms to a convolution instead of six as heretofore assumed. The *double-strand* spiral will have only six atoms to a convolution, even if thus interconnected, but the successive diazine rings will be displaced sixty degrees from one another.

In the spiral diagrams the horizontally exteneding lines at the sides of the spirals are joined to oxygen atoms (not shown). The distance between successive oxygen atoms *along the lengths of the spirals* will be 4.5 Angstrom units, and the widths of the large hexagonal compartments will be 10 Angstrom units. These are the identity intervals which stand out most prominently in the X-ray diffraction photographs of natural proteins.

Many other patterns could be produced beside the one at the bottom of the preceding page. Flat grids could be formed by connecting adjacent spirals only along diametrically opposite sides, and the grids connected to one another through longer side-chains. With the seven-sided single-strand spirals, a still greater variety of patterns could be produced.

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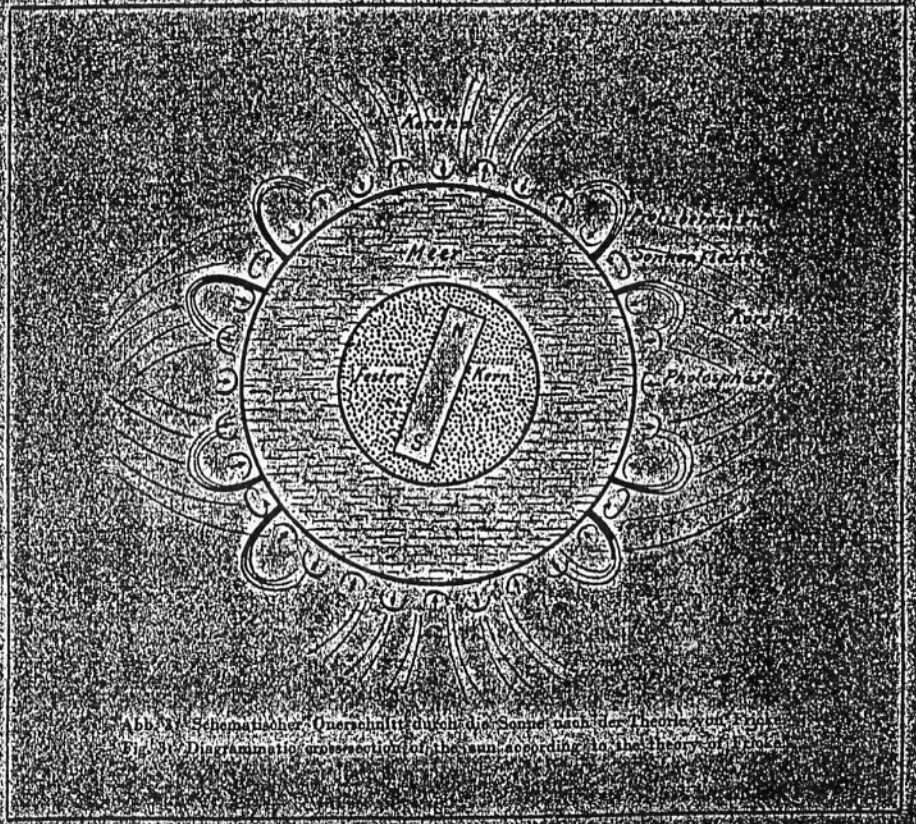


Abb. 1. Schematischer Querschnitt durch die Sonne nach der Theorie von Erick
Fig. 1. Diagrammatic cross-section of the sun according to the theory of Ericke

I even could feel the cold gravel on my bare feet.

When I reached the steps I could go no farther. Standing inside the screened door was my beloved step-grandmother, Mrs. Lelah Picaman. I knew it was her although the gloom left her features too shadowed for identification. Then I heard her sweet voice, which had made me her willing slave when Grandpa first brought her home when I was 10 years old. She said to me lovingly, "No dear, go back. Remember me as I was."

I began crying bitterly, and once again was in a New Mexico ranch bedroom. My husband rushed in to see what was wrong, and I told him over and over, "Grandma is dying, I know she is dying." He kept insisting I'd had a bad dream, until finally I believed him and went to sleep.

When our friends returned a few days later they drove us back to my parents' home in town. Mother silently handed me a telegram. I said, "I know Mother, Grandma is dead." She had passed away November 11, the day after my experience. It was only then that they told me they had known for some time that Grandma was dying of cancer, and that it was her wish that I not be told.

Some years later I visited the aunt who had been with Grandma when she died. When I related this story, she told me that the weather had been as I described it, and that Grandma had spoken of me in her last lucid moments the day before she died. She remembered how we had loved each other immediately, how like her own grandchild I had been. She had wished to see me and had wondered what my child would be.

I always hoped that her dying wish was granted—that she did see me as clearly as I heard her lovely voice for the last time.—*Alamagordo, New Mex.*

ALL THUMBS

WHILE decorating a goal post for a football game at an Oklahoma City, Okla., high school, Johanna Lochhead, 15, fell and fractured her left thumb. A few days later, while practicing for a football game, her brother, Roger, 16, also fractured his left thumb.

CAN SUPERMATTER CONQUER GRAVITY?

An experimentally established fact suggests that man may overcome gravity through use of "supermatter."

By C. F. Krafft

THE USE OF "supermatter" (a condensed form of gaseous ionized matter) for spaceship propulsion recently has been suggested. The disintegration of this "supermatter" would liberate large numbers of positive ions which not only would give the entire spaceship a positive charge, but also would propel it, by repulsion, from the liberated ions if they all are sent out in one direction.

Such a positively charged spaceship would have an antigravitic action by virtue of the Biefeld-Brown effect, which is the tendency of a charged condenser to move in the direction of the positive charge. *This is not a theory but an experimentally established fact.* It can be explained on the basis of the ether vortex concept because, in a charged condenser just as in a hydrogen atom, there is a direct flow of ether from the positive charge to the negative charge. This necessarily reduces the ether pressure on the outer side of the positive charge and increases it on the outer side of the negative charge. If we accept the modern view that the force of gravity is caused by a pressure gradient in the ether, then such a difference of pressure on opposite sides of a charged condenser would force the condenser in the direction of the positive charge.

A positively charged spaceship or flying saucer, in conjunction with the earth, would constitute such a condenser. Although the earth is always at zero potential, it would be negative relative to the

positively charged spaceship. The ether, therefore, would flow directly from the spaceship to the earth and this would reduce the ether pressure on the upper side of the spaceship. Such a reduction of ether pressure immediately above the spaceship would result in a lifting force in direct opposition to the downward pull of gravity. By controlling the intensity of the electrostatic charge it should be possible either to keep the spaceship hovering in mid-air or to move it vertically upwards.

If gravitational forces can be overcome in this manner then inertial forces would probably be affected also. In the usual methods of propulsion the driving force is applied mechanically at only one place. This produces an undesirable inertial reaction upon the pilot and would kill instantly any human pilot at the acceleration frequently observed in the movements of flying saucers. With electrostatic propulsion of the kind suggested above, the driving force is not applied mechanically but electrostatically to spaceship and pilot alike. The pilot therefore would move along with the spaceship without experiencing serious inertial reaction.

This scheme has another interesting possibility. A person could wear, next to his body, a metallic belt containing a supply of supermatter undergoing gradual disintegration so as to keep his entire body positively charged. His body, in conjunction with the earth, then would constitute an electric condenser and be subject to the Biefeld-Brown effect, relieving him of at least some portion of his total weight.

REAL GONE

A STRONG wind, whipping through Ionia, Mich., knocked over the screen at a drive-in theatre. The theatre's roadside billboard read: "Now playing: 'Gone With the Wind.'"

WON AND LOST

ALEXANDER E. ROBINSON, a 15-year-old high school boy living in Aurora, Colo., won the $100 first prize in a safety poster contest. While replicas of his winning poster were displayed on billboards, the youth was killed in an auto accident.

Fingers of FATE

By Harold Helfer

On the Island of Hoopuloa, Hawaii, a church rang its own requiem. The bell tolled during a volcano eruption as a great wall of lava swallowed the building.

●

Edward Zeidler, Pittsburgh, Pa., apparently awakened to find his wife dead of a heart attack during the night. The next day a neighbor, noting lights burning in the Zeidler home, investigated and found that Mr. Zeidler also had died during the night of a heart attack.

●

Twins Roland and Donald Bezella, Milwaukee, Wis., who were born at 9:13 Aug. 13, last year reached their 13th birthday. Their mother, whose birthday is July 13, was in room 413 at the hospital, and had been married 13 years, when the boys arrived. Ronald and Donald, who each have 13 letters in their names, were baptized on the 13th Sunday of the year and were graduated from eighth grade on June 13.

●

When Frank Hurley of Chicago began gasping for breath, his brother, Walter, telephoned for the doctor. When the doctor got there Frank was dead. So was Walter, who had collapsed immediately after making the phone call.

●

Loretta Moss of Woodland Hills, Calif., was born on February 18th; her mother was born on February 19th; her father was born on February 20th; her sister, Kathleen, was born on February 21st and, sister, Margot, was born on February 22nd.

●

While Dr. Norman Leet of Oakland, Calif., was addressing an audience on *The Vagaries Of Heart Attacks*, he collapsed and died.

●

Billie and Polly Sue Jones of Hazel, Ky., and Billie and Polly Sue Jones of Benton, Ky., met for the first time in a hospital at Murray, Ky. The couples, unrelated, became the parents of daughters.

●

The Rev. Leonard Tingle, London evangelist, was struck and killed by lightning while singing *Have You Any Room For Jesus?*