

SCIENCE NEWS

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THE FLUIDITY OF HELIUM

THE stature of Professor Albert Einstein's genius reached new heights when it was disclosed that the learned mathematical physicist developed mathematics fifteen years ago which are now helping to solve the mysteries of the amazing fluidity of helium near the absolute zero of the temperature scale. Before the symposium on intermolecular action of the American Chemical Society Professor F. London, of the University of Paris, now visiting professor at Duke University, credited Professor Einstein with the concept of an "ideal" gas which appeared in papers published in 1924 and 1925.

The Einstein 1925 reports were not about relativity theory, but discussed problems seemingly without any practical significance at the time. They described the degeneracy of an "ideal" gas near the lower limits of the scale of temperature. Because all gases were known to be condensed to liquids at the temperatures in question, scientists rather overlooked the Einstein work of fifteen years ago.

However, the recently discovered behavior of liquid helium has brought the side-tracked Einstein concept to new usefulness. Most liquids increase in viscosity, become stickier and flow less easily, when they become colder. The phrase, "colder than molasses in January" is the layman's concept of viscosity and a correct one.

Liquid helium, however, is a baffling exception. At the temperature known as the "delta" point, only 2.19 degrees above absolute zero, liquid helium flows better than it does at higher temperatures and, as a matter of fact, the liquid helium is about as nebulous as a gas. Added puzzles in its strange behavior include its enormous ability to conduct heat. At the delta point it is about 500 times as effective in this respect as copper at room temperature. Liquid helium, with these and other anomalies, has posed a major mystery for physicists and chemists.

Professor London stated that the interpretation of the behavior of liquid helium can best be explained by considering it as a Bose-Einstein "ideal" gas, by using the mathematics worked out in 1924-25, and by taking over also some of the concepts of the electrical conduction of metals. By simple analogy, the amazing fluidity of liquid helium can be partially explained by picturing the fluidity as something akin to the wandering of electrons in metals to explain electrical conduction.

THE ENERGY OF COSMIC RAYS

DECEMBER 28 was cosmic ray day at the meetings in Washington of the American Physical Society and leading experts in the studies of these piercing, baffling radiations from outer space reported:

1. Cosmic ray electrons entering the earth's atmosphere have energies greater than 2,000,000,000 electron volts.

2. The development of automatic apparatus to record the "showers" of atomic debris caused by cosmic rays striking materials on earth.

3. Improved apparatus for determining cosmic ray intensities high in the atmosphere during robot stratosphere balloon flights has been developed.

4. No observed difference between day and night cosmic ray intensity at high altitudes.

5. Measurements of the "life" of the heavy electron (mesotron) particles that show they last only a few millionths of a second.

Professor R. A. Millikan and Dr. H. V. Neher, of the California Institute of Technology, reported the results of 10 new balloon flights almost to the top of the earth's atmosphere which give a lower limit of energy for cosmic ray electrons as 2,000,000,000 electron volts.

The automatic "shower" records were described by Dr. W. F. G. Swann and Dr. W. E. Ramsay, of the Bartol Research Foundation of the Franklin Institute, while Drs. L. F. Curtiss, A. V. Astin, L. L. Stockmann and B. W. Brown, of the National Bureau of Standards, told of their improved recording circuits devised for studies of cosmic ray intensities at high altitudes.

In papers with Drs. S. A. Korff and M. A. Pomerantz, Dr. Thomas H. Johnson, assistant director of the Bartol Research Foundation, described high altitude attempts to find a night-day difference in cosmic ray intensity and experiments on the absorption of the mesotron particles in air and lead which indicate new estimates of the "life" of these new-found atomic particles.

ROBERT D. POTTER

ENERGY PRODUCTION IN STARS

CARBON, so vital to life on earth, is now revealed as the transmuting catalyst in the sun which makes it possible for hydrogen atoms to combine into helium and thus release the vast store of nuclear energy which makes the sun shine on and on through the ages.

The Morrison Prize of \$500 to Professor Hans A. Bethe, of Cornell University, for the theory which produces this picture of the cause of solar energy brings public recognition to something which scientists have known for some time.

The details are ingenious and important. Carbon atoms are transmuted by swift-moving hydrogen nuclei into nitrogen. These nitrogen atoms are again struck by hydrogen particles and eventually create helium atoms and regenerate carbon atoms with the release of enormous energy. It is the hydrogen on the sun which is used up in the process, while the carbon content of the sun remains pretty much the same.

But many people will leave the intricate details of the process to the scientists and jump mentally onward to a most important question for all of man's descendants on earth in the millions of years to come.

That question is, "What happens to the sun and to the earth as the sun goes on using up its hydrogen to create the solar energy?" And the answer is one of flaming death for the earth, as contrasted with former pictures of the earth becoming colder and colder as the sun's energy diminishes. True, the sun probably will become

a cold body and hence the earth, too, will sink into an ultimate frozen state, which is known already to have overtaken other stellar objects. But before that day comes, the sun is going to become much hotter than it now is and life on earth, as man knows it, will probably end. That forecast of the end of the world is an outgrowth of the theory of Professor Bethe on the transmutation of hydrogen into helium on the sun as the cause of solar heat and radiant energy.

Professor George Gamow, at George Washington University, ten years ago worked out the theory of nuclear transformations which made it possible to calculate exactly the rate of energy liberation due to the transformation of the elements at the enormous temperatures of several million degrees existing inside stars and particularly inside the sun. In recent work he has extended his studies to include the evolution of stars as they transmute their hydrogen into helium atoms. The main result of the constantly decreasing hydrogen content, it is pointed out, is to increase the luminosity of such stars and to increase their outpouring of energy. Professor Gamow estimates that the sun at the present time consists of about 60 per cent. hydrogen. Most important, the sun is bound to become about 100 times brighter than it is at present when its hydrogen content drops only a few per cent. "Such brightening of the sun will necessarily lead to the melting of the earth and, of course, to the disappearance of life," he stated in a recent lecture.

This then, at the present time, is the best concept of the end of the world. But before alarms need be raised by present occupants of the earth it should be added that while the sun may be getting hotter it is doing so most slowly as measured by man's calendar. It is believed that there has been no observable climatic change in historical time due to an increase in the luminosity of the sun. Hence the end of the world, from this cause at least, is millions upon millions of years in the future.

ICE AGE HISTORY OF THE EARTH

BETTER knowledge of the Ice Age history of the earth is obtainable from a great chart of the ocean bottom off the eastern coast of the United States, from Chesapeake Bay to Cape Cod, prepared for the annual meeting of the Geological Society of America meeting in New York City by A. C. Veatch, consulting geologist of New York City, and Lieutenant Paul A. Smith, of the U. S. Coast and Geodetic Survey.

This chart was made for special geological study, under the auspices of the Geological Society of America, from surveys conducted by the U. S. Coast and Geodetic Survey, under the direction of Rear-Admiral L. O. Colbert, for use in practical navigation. The chart, which is on the large scale of 1 to 120,000, was compiled from many thousands of echo soundings of the bottom, and show the submerged hills and valleys, plains and canyons, as clearly as any topographic maps of the land. They give the first really detailed picture of a large piece of sea floor that scientists have ever had a chance to inspect as a whole. Four large sheets were shown to the geologists; the fifth,

which will complete the chart, is now being finished in Washington. Geological interpretations of the off-shore topography were made by Mr. Veatch, who was seriously ill as the society met and who died before the meeting. The paper was presented in his absence by Lieutenant Smith. Among Mr. Veatch's conclusions are these:

(1) The off-shore canyons of which so much has been heard are only conspicuous features in a submarine landscape which is "finely dissected" into many smaller valleys, ridges and hills along the coastal slope.

(2) The coastal shelf, behind the slope, is a smooth, comparatively flat submerged plain.

(3) The notable canyons cut back into this plain, and one of them, the Hudson, has been definitely connected to a land valley.

(4) Besides the Hudson Canyon, there is a submerged Hudson Channel, which is shallow and flat bottomed, with a width of about ten miles, at a depth of 35 fathoms (210 feet). At the 43-fathom level this wide channel shows a delta formation, and this is taken by Mr. Veatch as a definite measurement of a long-continued earlier stage in the sea level.

The lowest level which the sea ever reached, as measured by these submarine canyons, is represented by the Congo Canyon off the coast of Africa, which shows an extreme depression to 12,000 feet below present sea level. Cutting of this canyon, according to Mr. Veatch, began in post-Mousterian (Old Stone Age) time, and the ocean did not finally return to its present level until 5,000 years ago, or after the beginning of written history.

Present-day practical uses of this detailed chart will include guiding ships by means of echo soundings when fog or darkness blot out all other navigation marks. Navigators will be able to "see" a transect of the bottom beneath their ship as clearly as aviators do a mountain landscape under bright sunlight.

RACIAL PSYCHOLOGY

STATING that no conclusive evidence has been found for racial or national differences in either intelligence or personality, psychologists have issued an official protest against the "non-scientific interpretations" of racial psychology which "Fascists are using to justify persecution." These theories have been developed, they said, not on basis of fact but under domination of powerful emotion. Prepared by psychologists who are specialists on racial psychology after a survey of scientific investigations in this field, the protest was issued officially by the Council of the Society for the Psychological Study of Social Issues.

Members of the council are: Dr. F. H. Allport, Syracuse University, Dr. Gordon Allport, Harvard University, Dr. J. F. Brown, University of Kansas, Dr. Hadley Cantrell, Princeton University, Dr. L. W. Doob, Yale University, Dr. H. B. English, Ohio State University, Dr. Franklin Fearing, University of California, L.A., Dr. George W. Hartmann, Columbia University, Dr. I. Krechevsky, University of Colorado, Dr. Gardner Murphy, Columbia University, Dr. T. C. Schneirla, New York University, and Dr. E. C. Tolman, University of California.

TEXT OF THE PROTEST

The current emphasis upon "racial differences" in Germany and Italy, and the indications that such an emphasis may be on the increase in the United States and elsewhere, make it important to know what psychologists and other social scientists have to say in this connection.

The fascists and many others have grossly misused the term "race." According to anthropologists, the term "race" may legitimately be used only for such groups as possess in common certain physical or bodily characteristics which distinguish them from other groups. It is impossible to speak correctly of a "German race" or of an "Italian race," since both of these groups have highly diversified physical characteristics.

A South German may resemble a Frenchman from Auvergne or an Italian from Piedmont more closely than he does a German from Hanover. North Italians are markedly dissimilar from those living in Sicily or Naples.

More important still, the emphasis on the existence of an "Aryan race" has no scientific basis, since the word "Aryan" refers to a family of languages and not at all to race or to physical appearance.

As far as the Jews are concerned, scientific investigations have shown them to be tall or short, blond or dark, round-headed or long-headed, according to the particular community studied. In the light of this wide variation in physical characteristics, almost all anthropologists outside of Germany and Italy would agree that it is scientifically impossible to speak of a "Jewish race," much less of an "Aryan race."

In the experiments which psychologists have made upon different peoples, no characteristic, inherent psychological differences which fundamentally distinguish so-called "races" have been disclosed. This statement is supported by the careful surveys of these experiments in such books as "Race Psychology" by Professor T. R. Garth, of the University of Denver; "Individual Differences," by Professor Frank S. Freeman, of Cornell University; "Race Differences," by Professor Otto Klineberg, of Columbia University, and "Differential Psychology," by Dr. Anne Anastasi, of Barnard College.

There is no evidence for the existence of an inborn Jewish or German or Italian mentality. Furthermore, there is no indication that the members of any group are rendered incapable by their biological heredity of completely acquiring the culture of the community in which they live. This is true not only of the Jews in Germany, but also of groups that actually are physically different from one another. The Nazi theory that people must be related by blood in order to participate in the same cultural or intellectual heritage has absolutely no support from scientific findings.

MARJORIE VAN DE WATER

ITEMS

EVIDENCE that during the Ice Age the water off the northern Atlantic coast of what is now the United States was Arctic in character is given by Dr. Fred C. Phleger, Sheldon traveling fellow in geology. Dr. Phleger examined cores of sea bottom sediment collected by Dr.

Henry C. Stetson, of Harvard University. In them he found shells of the one-celled animals known as Foraminifera, very similar to species that now drift in the waters of the Arctic Ocean.

THE great New England hurricane last fall did enormous damage to bathing beaches along the coast of southern New England, yet much of the damage is already being healed by natural processes, according to the report of Drs. Robert L. Nichols and Lawrence Goldthwait, of Tufts College. Some of the beaches will be in condition for use as early as next summer, although others will require longer for natural repairs. The great damage done by the hurricane was due principally to the piling up of tremendous masses of water, when the 150-mile off-shore wind happened to coincide with the period of normal high tide. The wind caused the water to rise from 10 to 15 feet higher than the usual high tide mark.

DEFORMITIES in children should be corrected at the earliest date possible—a few within the first week of life and all before the child reaches school age. Calling on the medical profession to realize the severe mental reactions and the personality changes that result from uncorrected deformities, Drs. Claire L. Straith and E. Hoyt De Kleine, Detroit surgeons, report on plastic surgery in childhood in the *Journal of the American Medical Association*. Inferiority and shame, peculiar personality traits and anti-social tendencies are likely to develop as the result of such deformities as facial birthmarks, saddle nose, hunchback, crossed eyes, lop ears, disfiguring scars, harelip and cleft palate.

THE U. S. Public Health Service reports that two out of every thousand college students in the United States are infected with syphilis. The figure was arrived at by blood tests of 78,388 undergraduates in more than 500 American colleges made in a study by staff members of the service for the American Social Hygiene Association. The significance of the findings lies in the fact that efforts to control syphilis in the nation must, to be effective, begin with individuals in the age-group of first exposure to the infection. Control in this age-group, of which college students form an important section, offers real and perhaps the only hope that the general syphilis rate can be materially reduced.

PIGS on a too-exclusive diet of corn get a disease resembling the pellagra to which humans on the same kind of diet become victims, and they can be cured with the same substance, nicotinic acid. This has been demonstrated in experiments at the Lister Institute, London, and at the Institute for Animal Pathology in Cambridge, by Dr. Harriette Chick, Sir Charles Martin and a group of collaborators. Young pigs kept on a "straight" corn ration for three or four months were almost at the point of death, with all the repulsive symptoms of advanced pellagra, when they were given injections of nicotinic acid. Recovery began within twenty-four hours, and within six weeks normal health and appetite had been restored.