

## SCIENCE NEWS

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## SOME PAPERS PRESENTED AT THE MEETING OF THE AMERICAN ASSOCIATION AT THE FIFTIETH ANNIVERSARY CELEBRATION OF THE UNIVERSITY OF CHICAGO

DR. R. A. MILLIKAN proposed the hypothesis that cosmic rays are created by the suicide of atoms in the loneliness of interstellar space, in the same manner that light is created by the partial self-destruction of atoms in the densely packed interiors of the stars. This hypothesis rests on discoveries made in five recent research projects by his fellow-workers in the Norman Bridge Laboratory of Physics. In sum, these researches indicate that atoms of five elements are far more abundant in interstellar space than those of any other element, and that such atoms are capable of transmutations, giving rise to high-speed particles like those that constitute cosmic rays. The broad surface of the earth itself is the spectroscopic screen on which should be spread the distinctive bands of cosmic rays, each characteristic of the element from which it originated. If they actually are found distributed in accordance with Dr. Millikan's prediction, this will constitute substantial evidence in favor of its validity. They are predicted as being thus distributed because the magnetic field of the earth should bend each band aside in proportion to the energy or speed of the incoming rays. The five elements for which the five identifying bands are sought are helium, carbon, nitrogen, oxygen and silicon. At least partial evidence has already been discovered that some of the bands exist. The discovery or non-discovery of the remaining ones will be critical for his hypothesis.

THAT atomic bullets as powerful as some of the cosmic rays and the most energetic man has ever produced—96,000,000 electron volts—have been manufactured with the University of California 225-ton cyclotron was reported by Dr. Ernest O. Lawrence. This is six times the highest energy previously achieved, that of deuterons (heavy hydrogen) at the same maximum speed. With carbon bullets Dr. Lawrence expects to be able to take six steps up the atomic ladder in transmuted elements. If iron were bombarded it would become arsenic. With the giant new cyclotron now building at Berkeley, carbon bullets of 600,000,000 electron volts will be possible. The research accelerating carbon atoms from carbon dioxide gas was done by Dr. Emilio Serge and Cornelius Tobias in the University of California Radiation Laboratory.

COSMIC rays are protons, "hard," high-speed atomic particles, when they arrive at the outer boundary of the earth's atmosphere, is indicated by experiments reported by Dr. William P. Jesse, Dr. Marcel Schein and Dr. Ernest O. Wollan, of the University of Chicago. On striking the atmospheric atoms, they give rise to the "middle-weight" particles known as mesotrons. Evidence supporting this conclusion was obtained by sending recording instruments aloft attached to free balloons that reached heights as great as fourteen miles.

NINETY-NINE per cent. of the weight of the earth is made up of only nine of the 88 known elements, was stated by Professor Henry Norris Russell, of Princeton University. All the rest have only one per cent. to divide among them. The same group of elements also make up the bulk of the other objects in the visible universe: stars, nebulae, comets and the meteorites that bring to us the only samples of the cosmos that we can actually get our hands on. Proportions are different, however: hydrogen, for example, makes up only half of one per cent. of the accessible earth-parts, whereas it constitutes the bulk of some of the stars.

WAR against epidemics of influenza or similar diseases that are particularly menacing in barracks, draftee camps, schools and other public buildings may be waged by spraying the air with shrapnel-like photons or particles of ultra-violet light. Possibilities of this method of controlling air-borne epidemics in wartime were described by Dr. Harvey C. Rentschler, director of research for the Westinghouse Lamp Division. Lamps for setting up a barrage of ultra-violet particles in the air and delicate measuring cells for predicting in advance the exact amount of ultra-violet radiation and the time needed to exterminate nearly all the germs in a given volume of air have now been developed. "Irradiated in an air-conditioning system, particles or photons of ultra-violet resemble somewhat the shrapnel sprayed at a fleet of raiding bombers," according to Dr. Rentschler. "Some of the ultra-violet photons make direct hits which disintegrate thousands of bacteria. Other photons miss their mark and still others score partial hits which cripple germs and render them ineffective. The result is air cleansed of 90 per cent. or more of its bacteria count."

DROPPING without a parachute through two or three miles of thin air will not cause a man to lose consciousness unless he is scared. On the contrary, the experienced jumper thinks faster and more clearly. His sight seems to be improved but his hearing is poorer. He breathes more rapidly but his heart action is little affected. These, in summary, are the physiological effects of long drops, as reported by Professor Andrew C. Ivy, of Northwestern University. Data were gathered during five high-altitude delayed-opening jumps by A. H. Starnes. Mr. Starnes was described by Professor A. J. Carlson, of the University of Chicago, one of the group of scientists conducting the research, as "one of the coolest-headed, most courageous men I have ever met." He keeps his wits about him even when tumbling and spinning through space in the most hazardous positions. He has made some 300 jumps from all altitudes up to 10,000 feet. In his jumps, Mr. Starnes carries a motion picture camera to record

type and rate of spin, a barograph to record atmospheric pressure changes, a broadcasting transmitter, an altimeter, an automatic stop watch, and special oxygen mask and helmet. With his aviator's suit, all this apparatus increases his own body weight of 190 pounds to a jumping weight of about 300 pounds.

DR. CLAUDE E. ZOBELL, of the Scripps Institution of Oceanography, stated that bacteria and other minute forms of life, of types definitely belonging to the land, are found in the upper air far out over the oceans. Besides the land microorganisms, there are many bacteria that are known only from salt water. The sea bacteria get into the air encased in droplets of water cast up by the sea in a number of ways. These droplets are not much larger than bacteria themselves; their average diameter is about one micron, or 1/25,000 of an inch. Dr. ZoBell explained that "a particle the size of a bacterium would be carried nearly 3,000 miles by a steady wind having a velocity of ten miles per hour before it would fall to earth from a height of 100 feet, and it would be carried farther aloft by an updraft of 0.7 miles per hour. Thus any small particle which finds itself in the air may be suspended there almost indefinitely unless carried back to earth by larger droplets of precipitation. The horizontal distance over which microorganisms may be transported is almost limitless and is largely determined by their ability to survive the atmospheric environment. While undoubtedly many of the bacteria carried into the air are killed almost immediately by sunlight, desiccation, ozone or other adverse conditions, marine bacteria have been known to survive suspended in the atmosphere for several hours and the terrestrial bacteria found over the ocean hundreds of miles from land must have been in the air for several days or a few weeks." The number of pollen grains found in the air over the ocean depends on distance from land and direction and velocity of the wind. As compared with numbers over the land, pollen grains over the ocean are very scarce—from less than one to some 16 or 18 per cubic meter of air, as measured over the Atlantic between Sweden and New York. Pollen counts in air over land average 18,000 per cubic meter. Virtually no pollens are found in the purest marine air.

PARAMECIUM is a microscopic one-celled animal that swims in stagnant waters. Its aggregations, forming the most elementary kind of social groupings, are held together by chemical attraction. The chemical basis of this simple society was described by Dr. H. S. Jennings, of the University of California at Los Angeles. The water around an individual Paramecium becomes faintly acid. Another Paramecium, chancing into this acidified zone, becomes unable to leave it. Every time it approaches the boundary, it is impelled to turn back. Dr. Jennings found that he could reproduce this chemical social attraction simply by introducing a bubble of carbon dioxide into the water. It set up a charmed chemical boundary just like that of the Paramecium's natural secretion, which the little animals could enter but which they could not leave. While Paramecium normally reproduces simply by splitting into

two parts, it does at times form sexual unions. There are not merely two well-defined sexes in this animal group, but four sex types, capable of six different ways of pairing off. When masses of individuals of two different sex types are mingled, instead of simply pairing off, they rush together into a tight crowd, which sticks together "as if their bodies were covered with glue." None seems to be able to leave, although "often an individual visibly struggles as if trying to escape from the attachment to another individual, but in vain." Finally, they break up into smaller groups, and then into mating pairs. These exchange halves of chromosomes, then separate and swim their solitary ways, proceeding to multiply by division.

BUDS on the tips of plant branches literally poison their younger brothers to maintain their position of dominance. They secrete a growth-checking substance which prevents the development of lateral buds, or at most permits them only limited growth. According to Dr. John W. Mitchell, of the U. S. Department of Agriculture, it has long been known that plant stems continue their growth because the bud at the end has this dominance over other buds. It has also been known that if the terminal bud is removed, other buds farther down begin to develop, sometimes with a new establishment of dominance by one of the awakened lateral buds. But there has been no agreement among botanists regarding the mechanism underlying this phenomenon. Lately, however, it has been demonstrated that substances extracted from certain parts of plants inhibited growth when applied to the buds of a normal plant. Synthetic growth-regulating substances have also been prepared which have similar effects.

THAT evolutionary changes in plants can be promoted by treatment of actively growing tissues with sulfanilamide, which produces effects similar to those brought about by colchicine, was reported by Professor John M. Beal, of the University of Chicago. The germ-killing drug stops the process of mitosis or cell division in mid-career, causing the formation of extra large cells with double or quadruple the normal number of chromosomes. This in turn often brings about the origin of strange new plant varieties, some of them giants.

PROFESSOR CARLOS MONGE, of the University of San Marcos, Lima, Peru, stated that life at two to three miles above sea-level, where the system has to become used to getting along on little more than half rations of oxygen, has transformed the people of the Andean uplands into a distinct physiological variety of the human species. Lowlanders going into high country become acclimated after an initial period of "mountain sickness"; but the permanent dwellers at great altitudes are not merely acclimated, they are adapted, and have measurable differences in both physique and chemical constitution from the lowland peoples, the eminent Peruvian scientist stated. There are certain similarities between a height-acclimated lowlander and the permanent altitude dweller. In both, the blood is actually "thicker" than it is at sea-level: the fluid is more viscous and the corpuscles are both larger and more numerous.

There are also notable chemical changes in the blood, especially in relation to oxygen and carbon dioxide exchange. However, the highlander's heart is larger in proportion to his body, his lungs have larger air capacity and their capillaries bring the blood more efficiently into contact with the air. Pulse rate is definitely slower, and even severe exertion fails to speed it up very much. This adaptation to living at great elevations has its reflection in the sociological behavior of the people. Every year, large numbers of Andean men, driven by necessity, migrate to the coastlands to work in the fields. But they never stay. They do not become acclimated to the "thick" air of the lowlands. The sociological effects of life at high altitudes show themselves also in population figures. Fertility drops sharply in people from the lowlands who migrate to the plateaus and stay there. This infertility at high altitude has been noted in animals as well as in human beings. Lowland stocks do not breed successfully on the heights. It is even difficult to hatch chicks from lowland eggs. The difficulty of raising enough meat animals was responsible for the transfer of the capital of Peru from its original site at Jauja, at 13,000 feet, to Lima at sea-level.

FURTHER evidence bearing on the mystery of submarine canyon origin was presented by Professor Reginald A. Daly, of Harvard University. He disagrees with those who hold that these gashes in the submerged edges of the continents, now known to be world-wide in their distribution, were cut by rivers during a period of recession in ocean level, and then re-flooded. He admits an ocean-level recession during the Pleistocene ice age, but claims that the canyons were cut under water nevertheless. His theory is that currents of water, heavy with mud, flowed under the clear water of the ocean, and that these did the cutting. The submarine currents flowed under the clean water because they were heavier, just as ordinary rivers flow through the land under a lighter atmospheric "ocean." The place of clouds was taken in the case of the submarine rivers by the lines of breakers, constantly piling fresh masses of water against eroding shores, to load themselves with silt and sand and flow down along the bottom, over the edge of the continental shelf. Rise of sea-level as the continental glaciers melted and refilled the ocean basins halted the process at the end of the ice age, and left the canyons drowned and hidden until their comparatively recent discovery.

TURNING coal into oil can be conducted more efficiently as a result of a discovery about relative transparency of thin coal slices, described by Dr. G. C. Sprunk, of the laboratory of the U. S. Bureau of Mines, Pittsburgh. Coal that is translucent when cut into thin slices by suitable apparatus can be converted into oil easily and economically. But when the coal slices are opaque, it is a sign that that particular product of the mine should be put to other uses than oil conversion.

GEOLOGISTS seeking oil have adopted and adapted a method first used by archeologists seeking ancient ruins, according to Dr. Edward W. Owen, petroleum geologist

of San Antonio, Texas. Some years ago, students of antiquity discovered that by flying high above terrain where ancient cities and fortifications once stood, they could often see traces of their outlines on the ground that could not be detected by observers at surface level. Similar methods are now beginning to be used by geologists, to trace the outlines of oil-bearing formations or other rock structure of economic importance or scientific interest. Information thus obtained is checked by other techniques already in use, such as the creation of artificial earthquakes with heavy charges of dynamite and the analysis of the waves which they send through the earth.

PROFESSOR WILLIAM S. COOPER, of the University of Minnesota, stated that the climate of America to-day is more like that of the Pleistocene ice age than was the period immediately after the glaciers had melted away. For several thousands of years after the ice age, the climate of North America was warm and dry. This conclusion was based on the examination of fossil pollen grains found in vast numbers in ancient buried bogs. They show the presence of mild-climate trees considerably north of their present limits of growth. Following the warm, dry period, the climate has become cooler and more moist during the past few thousand years.

SWALLOWING raw eggs, with the idea of getting some easily digestible protein, is all a mistake, according to Dr. Donald D. Van Slyke, of the Rockefeller Institute for Medical Research. If you really want to make egg-white digestible, he said, boil it hard, then rub it into fine particles through a sieve. Dr. Van Slyke's address had to do with the physiology of the amino acids, which are the units or building-blocks of which proteins are composed. There are twenty-one amino acids which the human body must have. Then it can manufacture itself out of other materials if they are not supplied from outside sources. The other eleven can not be synthesized within the body; they must come ready made, or we starve. Special effects of various amino acids have been studied on animals. Some of them have special actions, in neutralizing certain definite poisons.

VIRUSES of diseases like smallpox and yellow fever, that are followed by years-long or lifelong immunity to further attacks, are not cast out of the bodies of recovered patients. They remain with them as long as the immunity lasts. However, they are no longer to be dreaded, but become the servants of those who have bested them, steadily stimulating the production of substances that protect against new invasions. This theory of immunity following virus diseases was presented by Dr. Thomas M. Rivers, director of the hospital of the Rockefeller Institute, New York City. Other diseases caused by viruses leave the recovered patient immune for only a relatively short time. This is the case, for example, with influenza and the common cold. Following these maladies the body does rid itself of the virus. As a consequence, it has no continuing stimulus to produce immune substances, and when a new infection attacks there is no effective defense ready to repel the invader.