

PHYSICS

Cosmic Rays May Originate In Destruction of Elements

Evidence Presented by Dr. Millikan to National Academy Indicates Sun's Magnetism Extends in Space

NEW evidence for the creation of powerful cosmic rays through the annihilation of the universe's commonest chemical elements, sparsely scattered in the far reaches of space, was presented to the National Academy of Sciences by Dr. Robert A. Millikan, Nobel prizeman, of the California Institute of Technology.

The first evidence obtained by science that the sun's magnetic field extends out into space, enveloping the earth and the whole solar system, has also resulted from Dr. Millikan's latest cosmic ray researches.

Dr. Millikan, with his colleagues, Drs. I. S. Bowen and H. Victor Neher, probed the earth's atmosphere with balloons practically to its top. They found that the way in which the energy in incoming, highly penetrating cosmic rays is distributed gives evidence for the annihilation theory of cosmic ray production.

The most abundant elements that are destroyed in creating cosmic rays are carbon, nitrogen, and oxygen, together with relatively high percentages of sodium, silicon, and aluminum. These are among the commonest elements in the universe. The elements that give rise to cosmic rays range in atomic weight between 6 and 28.

Hydrogen, and perhaps helium, are also known to be extremely plentiful throughout the universe, and the fact that no cosmic rays corresponding to their energy of annihilation have been found gave Dr. Millikan his lead to the newly recognized extent of the sun's magnetic field.

The earth's magnetic field has been known to change the direction of cosmic rays. Similarly, the sun keeps the less powerful rays of hydrogen and helium origin from getting to earth.

Dr. Millikan summarized the new findings under four heads:

1. The curve of energy distribution of the incoming cosmic-ray electrons has a maximum at about 6 billion electron-volts.

2. This curve falls to less than one-third its maximum value both at an energy of 1 billion e-volts and at 20 billion e-volts;

3. This type of banded structure renders it unlikely that the cosmic rays originate in portions of the universe in which matter exists in appreciable densities; and

4. The observed energies of the cosmic rays are about those to be expected if the abundant elements have the capacity to transform their mass-energy completely into cosmic ray-energy.

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Benjamin Franklin in 1727.

Prof. Fox, as pathologist to the Philadelphia Zoological Society, has had ample opportunity to diagnose the disease in many living animals. He has also examined skeletons in several museums. The total number of animals examined was 1,749, of which 77 proved to be definitely arthritic.

Occurrence of the malady among animals appears to be as little governed by rules as it is among us suffering humans. It is not correlated with climate, location, food, focal infections, or kind of animal. It was most easily detected as an affliction of the spine, but was also found in other parts of the skeleton.

Animal families (*Turn to Page 287*)

ORNITHOLOGY

Audubon 100th Anniversary Marked by Exhibit of Art

See Front Cover

MARKING the hundredth anniversary of America's greatest early work on natural history, John James Audubon's *Birds of America*, a national exhibition of the works of the famous artist-naturalist will be held at the Academy of Natural Sciences of Philadelphia from April 26 to June 1.

In 1838 Audubon published the completing section of his marvelous series of colored plates showing the principal spe-



HOW HE LOOKED

This portrait of Audubon by his son, John Wodehouse Audubon, shows the great artist-naturalist as he appeared when in the field. Tradition has it that the elder Audubon painted the dog himself.

GENERAL SCIENCE

Wild Beasts Have Arthritis But Rats and Bats Are Immune

America's Oldest Scientific Society Hears Also Of Successful Use of Lindbergh's "Glass Heart"

GRANDPA Gorilla has his bad days with "rheumatiz", no less than his human nth-degree cousins. Hyenas have it, too—presumably they don't laugh then. It seems to be the same kind of rheumatism—arthritis—most common and most painful in human beings.

Occurrence of arthritis in wild animals was described by Prof. Herbert Fox of the University of Pennsylvania, who addressed the meeting of the American Philosophical Society in Philadelphia. The Society is the oldest of American scientific bodies; it was founded by

and herbs of the Western range lands is much more complex; some 25 or 30 distinct species of grasshoppers feed upon them, robbing cattle and sheep. Each of these species has its own habits and food preferences, so that the grasshopper-entomologist's life is not an easy one.

The grasshopper's history goes a long way back of Moses. The group of insects to which it belongs is reckoned as one of the more primitive ones, and includes other similar insects such as katydids and crickets. Wings and parts of bodies of the grasshopper cousinship have been found in geological deposits dating back scores of millions of years. Dinosaur and saber-tooth tiger have come and gone, but the grasshoppers we have always with us.

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afflicted with arthritis include cat, cow, deer, bear, hyena, baboons and anthropoid apes. It was not found among certain carnivora, notably the dog group; rodents and bats seem likewise to be immune.

"The ease of discovery of the disease in hyenas and gorillas should be emphasized," Prof. Fox remarked. "There is a strongly suggested similarity between the arthritis of the lower animals and that of the deforming and rheumatoid arthritis in man."

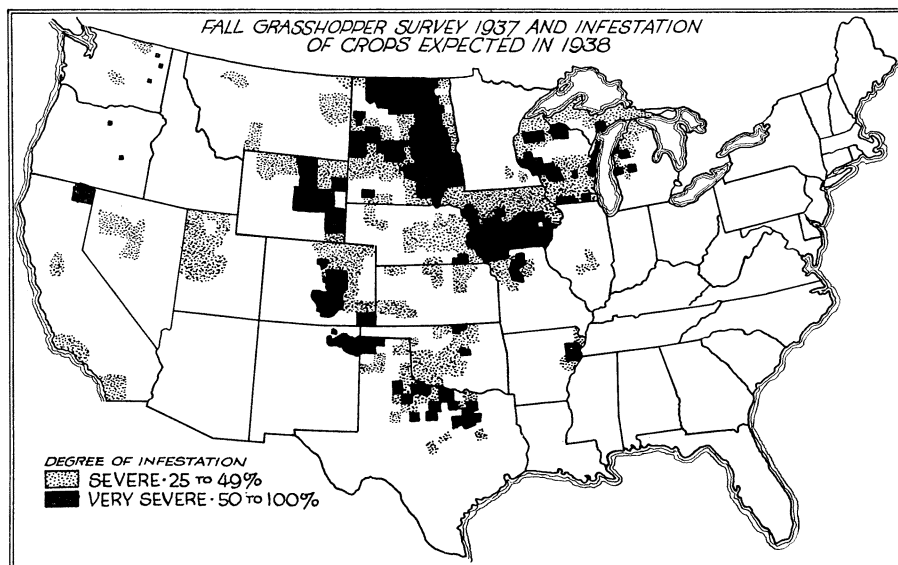
Lindbergh's "Heart" Ready

Col. Charles Lindbergh's invention, the "glass heart", has been used in over 900 experiments, totalling about 100,000 hours, to keep alive a large variety of organs from human beings and lower animals, Dr. Alexis Carrel of the Rockefeller Institute announced. He added:

"The method has reached the stage where it can be profitably applied to many problems in the fields of anatomy, physiology, biological chemistry, and pathology."

Among organs kept alive and working, for periods varying from two to thirty days, were hearts, lungs, livers, kidneys, spleens and other glands, arteries, veins, nerves, muscles, joints, and reproductive organs including pregnant uteri. The hearts kept on beating, the glands continued to secrete, and other organs continued their functions in the circulating medium. (See SNL, June 29, 1935.)

By modifying the chemical composition of the fluid, especially by the addition of insulin, adrenalin, and other glandular extracts, it became "possible to



ON A LOST BATTLEFIELD

Too late to do anything for what was once a prosperous cornfield, scientists and farmers survey the damage and plan reprisals for next season.

study how the morphological and physical activities of an organ are related to physicochemical conditions of its medium," Dr. Carrell stated.

Brain Waves Vary

Different parts of the head give rise to different kinds of brain waves, it was reported by Prof. E. Newton Harvey of Princeton University and Dr. Alfred L. Loomis and Garret Hobart of the Loomis Laboratory, Tuxedo Park, N. Y.

Brain waves are detected by setting light metal disks against various parts

of the skull and amplifying a million times the slight fluctuations of potential they set up. These waves have been used in the study of widely diverse phenomena such as sleep, hypnotism, epilepsy, etc.

The shapes and amplitudes of the brain-wave traces from the ear region are quite different from those obtained by placing the electrodes on top of the skull or at its sides. Patterns from corresponding positions on right and left sides of the center line usually correspond with each other, but at times a dis-

turbance may appear on one side and not on the other.

"Potential distribution over the human brain can be visualized by comparison with the disturbances in a slowly boiling liquid in which bubbles of gas are continually rising to break in ripples at the surface," said Prof. Harvey. "Large bubbles give rise to large slow waves while small ones give rapid rhythms.

"Sometimes the disturbance occupies a large area, sometimes a small. Bubbles appear in a nearly symmetrical pattern on right and left although a longer lasting disturbance, or one over a larger area, may occasionally occur on one side only. On the other hand, front and back show marked differences. In general many small bubbles arise at front (beta rhythms) and the medium size very regular bubbles at back (alpha rhythms). The distribution is continually changing.

"The pattern alters completely as sleep begins, passing through a definite sequence of changes until finally the whole liquid is pulsating to large regular bubbles about one a second."

Chilled Eggs Abnormal

Chilling the eggs of some of the lower animals causes abnormal development when they are restored to normal temperatures, Prof. Edwin G. Conklin of Princeton University told the meeting.

Prof. Conklin explained the mechanism of the changes as due to interruption of the normal whirlpool-like streaming of protoplasm in the eggs. Under ordinary circumstances this little whirlpool of life arranges the developing parts, but when it is temporarily stopped, cell division continues without its directive influence, and a state of biological anarchy results in the developing animal.

Australian Tribes Described

Primitive black natives of Australia were not without political organization, but such as they had was of the very simplest, Prof. D. Sutherland Davidson of the University of Pennsylvania explained.

The basic unit has been named the horde. It is a loose organization of from thirty to fifty closely related individuals who occupy a well-defined territory of varying extent, over which they exercise complete autonomy.

"Since the pre-European population of Australia is estimated to have been between 250,000 and 300,000 there must have been between 5,000 and 10,000 independent political entities on the continent, an astonishing condition when

compared with the aboriginal situation in other parts of the world," commented Prof. Davidson.

There was no higher organization in the sense of a central controlling government, but the natives did recognize larger groupings of hordes which were named on the bases of speech and cul-

tural practices and of territorial contiguity. These larger groupings contained from a few to several dozens of hordes each, and are considered as tribes.

Prof. Davidson has compiled a register of the tribes and hordes, under a grant from the American Philosophical Society.

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POPULATION

Racial Minorities, Not Those Of Culture, Problem in U. S.

RACIAL minorities, rather than national minorities, are America's problems, says Dr. Richard Hartshorne, University of Minnesota geographer, describing in the *Geographical Review* (April) the minorities in America and their distribution.

Europe's minority groups are largely cultural, so that the barber and tailor can change outward appearances in a few minutes. In America, the minorities are racial, and no beauty shop can make the descendant of a Negro slave who arrived in Virginia before the Pilgrims landed look very much like a white man. Thus Dr. Hartshorne describes the difference between Europe's and America's minority problems.

Only in a few localities, his researches show, is any other language than English (American) spoken by a majority of the inhabitants. Our racial minorities include the Negro, once imported as cheap labor; the Indian, an original inhabitant, who has been slowly forced out of the fertile lands into the desert; the Mexican, who came here as a laborer, or was a resident of Mexican territory ceded to the United States; and the Oriental, who came as cheap labor.

Each minority stays pretty close to some section of the country, so that in general, only one minority is of any importance in a given district. Thus, the Negro is the specific problem in the Southeast, the Mexican of the far Southwest, the Oriental of the Pacific coast, and the native Indian of the Southwest. Most members of the colored (non-white) races live in the seacoast and border states from southern New Jersey to northern California.

Mexican and native Indians, forming a large majority of the population in some parts of the Southwest, do not today feel any community of race, but "continued ostracism by the white pop-

ulation may lead to such feelings," concludes Dr. Hartshorne.

Intermixing of the eastern Oklahoma Indians and the Negroes of the same area, begun more than 200 years ago, will probably continue, resulting in a mixed colored race. Another minority, not racial, but sometimes treated with similar discrimination, consists of foreign-born persons. Their children, born in this country and educated in our schools, in general become full-fledged Americans, says Dr. Hartshorne; although some of the American-born descendants of southern European immigrants, brought up in foreign quarters of our large cities, are discriminated against as being un-American. Those born in other countries, says Dr. Hartshorne, are popularly classified as "furiners," and like all colored peoples, are not included as "100 per cent. American."

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GENERAL SCIENCE

New Service To Prevent Bibliography Duplication

A NEW intelligence service for scholars engaged in research is being inaugurated by Dr. Henry B. Van Hoesen, librarian of Brown University, who is secretary of the Bibliographical Society of America.

When the marshalling of references begins in connection with a research, the Bibliographical Society will carry a notice to its members telling by whom and where the bibliography is being prepared. Others working in the same field will be saved the trouble of duplicating the same compilation.

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There are ten veterinary colleges in the United States.