

PHYSICS

Successes in Atom Smashing Evaluated by Dr. Millikan

Heat of Sun and Stars Comes From Upbuilding Rather Than Annihilation of Atoms is View Now Gaining Acceptance

THE SUCCESS of recent atom-smashing experiments in upholding the famous Einstein equation for the equivalence of mass and energy gives fresh hope that the origin of cosmic rays in inter-galactic spaces is due to the building of heavy atoms out of energy-created hydrogen "cosmic ray dust."

Dr. R. A. Millikan of the California Institute of Technology re-assayed facts and theories in the light of recent developments when he presented to the American Association for the Advancement of Science's Century of Progress meeting at Chicago new results from his famous Pasadena laboratories. Speaking from the same platform as Dr. F. W. Aston, the British chemist who may be called the father of the isotopes, Dr. Millikan observed that Dr. Aston's success in measuring the exact masses of the elements gave the first quantitative information about the changes that occur inside the atomic hearts, which physicists are now studying so intently in order to solve the riddles of matter and energy.

Drs. Aston and Millikan are both Nobel Prize winners and they have gathered about them in two centers of physics, Cambridge and Pasadena, fruitful groups of associates.

Citing particularly the work of Prof. E. O. Lawrence, of the University of California, as an example of the experimental verification of Einstein's radiation-mass relationship in atom-smashing experiments, Dr. Millikan then applied the theories of Einstein and Aston to the cosmic rays.

Since 1925 Dr. Millikan and his group of experimentalists have been studying cosmic rays, and in the past four years special attention has been given to measurements of their energies. It was during this work last fall that Dr. Carl D. Anderson discovered that cosmic rays being absorbed by the nuclei of atoms give off a new kind of fundamental particle, a positive electron or positron.

At Chicago, Dr. Millikan incidental-

ly presented the first quantitative measurement of the mass of the positron. Dr. Anderson has just found that its mass is the same as the mass of the more familiar negative electron to within about thirty per cent., which is a very accurate measurement when it is remembered that the mass of the proton, or atomic hydrogen heart, is some two thousand times that of the electron.

The cosmic ray energy measurements lie between a hundred million and three billion volts, with positive and negative energies (*Turn to Page 15*)

ENTOMOLOGY

Rare Butterfly Specimen Is Half Male, Half Female

IN THE butterflies the two sexes are ordinarily in different individuals which are either wholly male or wholly female. But as in all other animals in which the sexes are in separate individuals it occasionally happens that nature makes a mistake and combines both sexes in the same individual.

Two-sexed individuals among the butterflies are very rare, but a considerable number have been recorded. In most of these one side is male and the other

side is female. Sometimes the sexes are combined in other ways, for instance parts of the wings sometimes show the male color pattern and other parts the female. But such combinations are inconspicuous in life so that they are seldom recognized and caught.

The picture below represents one of the common butterflies belonging to the group known as the skippers, in which the wings of the right side are male and in color mostly bright yellow, and those of the left side are female and are of a dull olive green. The two sexes are separated by a line down the middle of the body.

This individual, enlarged in picture, was captured at Cabin John, Maryland, and is now in the National Museum.

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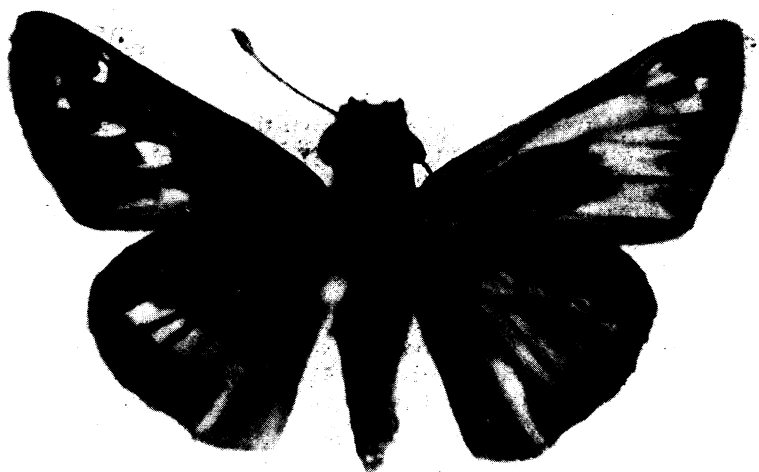
PHYSICS

Neon Atoms Smashed, Producing Rare Isotope

SMASHING atoms of neon, the once rare but now familiar gas, by the action of speeding neutrons, has been accomplished in the physics laboratories of the University of Chicago, by Dr. D. M. Gans, H. W. Newson and Prof. W. D. Harkins, a report to the American Association for the Advancement of Science reveals.

Neon is the heaviest element that has so far broken down under atomic bombardment. The products of its disintegration were helium and oxygen, mass 17. This particular type, or isotope, of oxygen is the rarest of the three isotopes now known. Most oxygen has a mass or atomic weight of 16. There is another isotope of mass 18.

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TWO IN ONE

disease. A number of lives have been prolonged in this way.

The new treatment which Dr. Evans hopes will be possible will be designed to stimulate the vital cortex of the adrenal gland to function anew and itself to produce enough of the necessary cortin to save the lives of Addison's disease patients.

This renewed functioning of the adrenal cortex may possibly be brought about by giving a certain substance from another gland, the pituitary. Recent studies show that the pituitary produces a substance that exerts a profound influence on the activity of the vital cortex of the adrenal gland.

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ARCHAEOLOGY

Court For Prehistoric Ball Games Found

DISCOVERY of a prehistoric ball court, where Mayan athletes played their ancient version of the American national sport, is reported by William T. Broughman of Marion, Indiana, who has just returned from explorations in Yucatan.

Mr. Broughman, who is a graduate of Indiana State University and describes himself as a "full fledged amateur" in archaeology, reported the find at Tulane University's Department of Middle American Research. Officials of the department said that the discovery affords new proof of their conviction that the ball game Poktapok was the Mayan national sport.

Mr. Broughman made his discovery while wandering over ruins of the ancient Mayan city of Kabah. Though the court is badly in ruins, he was able to trace the outline well enough to be sure of its identity.

Ball games, played with rubber balls long before Europe heard of rubber, were important events in the daily life of ancient Mexico. Early explorers from Spain observed the games with eager interest and told of honors heaped on the most skilful of the Indian athletes.

Dr. Frans Blom of Tulane has been gathering evidence to trace the origin of the game which Mayas and Aztecs so enjoyed. He is convinced that Mayan Indians who made so many other contributions to native civilization, were inventors of the game, which spread over Mexico.

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ARCHAEOLOGY

Seven Mummies From Texas Cave Brought to Smithsonian

SEVEN mummies preserved apparently by natural dryness of the Texas cave where they were buried, have just been received by the Smithsonian institution. The mummies shed new light on the prehistoric cave dwellers of the Big Bend region of Texas whose cave shelters have been explored in recent years by Dr. Frank Setzler of the Smithsonian.

Among the seven bodies is one almost perfectly preserved. Its expression is almost life-like and the hands are crossed in a peculiar fashion under the head. Even the original method of hair dressing remains. The body was buried upright in a deep deposit of wood ashes, wrapped in a rabbit skin robe. A basket was placed over its head.

Besides the mummy-like remains, some bundle burials also were in the cave. These consist of disarticulated

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bones, and represent a fashion of burial known to some groups of Indians.

Nearly all the skeletons had fractured legs or arms which had healed without benefit of setting. Since the cave where the burial was found is on the edge of a steep cliff, some 150 feet above the river plain, it is thought that the ancient people suffered frequent falls with broken bones the result.

The bones, together with basketry, sandals, arrow heads and other objects, are from a cave on the property of Mrs. Fate Bell in the canyon of the Pecos River. It was stated at the Smithsonian that Mrs. Bell's interest and willing cooperation have preserved the cave from looting by amateurs and for study by competent anthropologists. The material has been turned over to Dr. Setzler for intensive study.

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alike both as to numbers and distribution of values. Dr. Millikan sees these experimental results fitting in with his suggestion of a few years ago that the cosmic rays arise from a "clustering of hydrogen atoms into cosmic ray dust" in the depths of space and then an occasional sudden formation of helium atoms, oxygen atoms, an iron atom or even a uranium atom, releasing in these atomic syntheses the penetrating radiations that seem to pervade all space.

Dr. Aston's atomic mass measurements and deductions show that, if helium is made from hydrogen, twenty-seven million volt-electrons in energy are released. For oxygen, iron and uranium formation, the energy releases are figured at one hundred, five hundred and two thousand million volt-electrons, respectively.

Since a few of the cosmic rays have energies of over two thousand million volt-electrons, Dr. Millikan suggests the synthesis of highly unstable and transitory elements heavier than uranium, the heaviest discovered, but that these elements then disintegrate radioactively into the kinds found in the stars and on earth. Thus Dr. Millikan sees synthesis, instead of annihilation, as

playing an important part in the universe, admittedly a happier prospect for those who like to visualize the universe a going concern eons in the future.

Astronomers, as Dr. Millikan observed, are now abandoning the idea that the heat energy of the sun and stars comes from annihilation of the mass of atoms and are beginning to favor the idea that natural upbuilding of atoms within stellar bodies keeps them shining. With the origin of cosmic rays similarly explained by interstellar catastrophic formation of atoms, synthesis instead of disintegration or annihilation would play a major role in the universe.

Of the radiant energy rushing about the universe, the cosmic rays, totally unknown a few decades ago, are by far the most important. For Dr. Millikan deduces with astronomical estimates that the universe's total radiant energy in the form of cosmic rays is from thirty to three hundred times greater than that existing in heat, light and all other forms combined. Of the imports of energy received by the earth, the cosmic rays equal about one-half of the total energy coming in from the stars.

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