SCIENCE NEWS

WIRE STORIES ON THE MEETING OF THE NATIONAL ACADEMY OF SCIENCES

By Edwin E. Slosson, Director of Science Service

THE controversy over the Einstein theory of relativity was the most exciting event of the National Academy of Sciences in session at Washington on April 27 and 28. Three speakers argued in its favor and two against it. The sympathy of the audience was with the negative. Professor Dayton C. Miller, of the Case School of Applied Science, Cleveland, has repeated on Mount Wilson, Pasadena, the historic experiment on ether drift made by Michelson and Morley in the basement of that school in 1887. They got no evidence of relative motion between the ether and the motion of the earth in its orbit although they did not prove it absolutely zero. It is upon this negative result that Einstein, in 1905, founded his revolutionary theory of relativity.

But now Miller gets a positive displacement of the lines in the interferometer varying with the direction the instrument points and with the time of day and year, agreeing with the three known motions of the earth in space, its daily rotation, its annual revolution around the sun and its secular movement with the sun. The general result of his five thousand observations gives a motion of the earth relative to the ether of six miles a second, or about one third of the orbital velocity of the earth. This would indicate that the ether was partially dragged along with the earth, less on the mountain top than underground.

An unexpected contribution to the controversy was the telegram from Dr. W. S. Adams, of the Mount Wilson Observatory, read by Dr. George E. Hale, honorary director. This gave the first definite evidence for the Einstein theory from spectroscopic observations on stars.

Last year A. S. Eddington, of Cambridge, advanced the startling theory that the stars behaved like perfect gases even when they were denser than lead. This is because at such tremendously high temperatures in interior of stars the atoms are broken up into fragments of positive and negative electrons which can pack closer than the entire atoms. The heaviest element on earth is the metal osmium which has a density of about twenty-two times that of water. But one of the stars, the invisible companion of the familiar Dog Star, Sirius, though too small to be seen, is yet so heavy that its density figures out fifty thousand times that of water. Now Einstein predicted that light coming from a heavy star would be so retarded by gravitation that their wave length would be increased. This would shift the spectral lines toward the red end. Last year St. John, of Mount Wilson, verified this in regard to sunlight and now Adams finds the same effect in a star. The displacement observed agrees with that calculated from the theories of Einstein and Eddington.

A new test of the Einstein theory has been made by Professor A. A. Michelson, of the University of Chicago, and reported to the academy by Professor A. H. Compton. This experiment consisted in racing two rays of light in opposite directions around a rectangle of water pipe over a mile long from which the air had been exhausted. If the two rays had matched exactly on returning to their starting point it would have disproved Einstein, but the displacement observed, a quarter of a wave length, is that required by his theory.

Evidence against the prevailing theory that light consists of waves in the ether was presented by Professor A. H. Compton, who has been studying how X-rays break up the atoms and send the fragments flying. His experiments point towards the necessity of reviving in some form the older corpuscular theory of light.

Professor Heber D. Curtis, of the Allegheny Observatory, declared himself unconvinced of the Einstein theory, even though that might lay him liable to be called a "Fundamentalist in science." He thought that the measurements of star shifts obtained by President W. W. Campbell, of the University of California, on the Lick Eclipse Expedition to Australia in 1923 were too scattered to prove the displacement of stellar images predicted by Einstein, although Dr. Campbell considered them conclusive proof.

"The mode of the origin of species in mammals has now been completely determined by paleontology. So far from being a mystery little more needs to be done." This is the statement made by Dr. Henry Fairfield Osborn, director of the American Museum of Natural History, New York, to Science Service. His paper on "The origin of species as revealed by vertebrate paleontology; A rejoinder to William Bateson," was read at the recent meeting of the National Academy of Sciences, and gives the evidence on which this statement is based. At the Toronto meeting of the British Association for the Advancement of Science in 1921, Professor William Bateson, the founder of the British Genetic School, made the statement that "The origin of species remains utterly mysterious," and this ever since has been quoted in controversy as an authoritative denial of evolution, notwithstanding that Bateson took pains at the time to affirm his faith in evolution as a general principle. Now, however, Professor Osborn accepts the challenge of his old antagonist and lays down nine principles that have been developed or confirmed through his thirty-six years of paleontological research. Beginning with his study of the primates, the division to which man belongs, he followed it in an intensive study of the extinct group of titanotheres, an extinct family remotely related to both horses and rhinoceroses. The results of his sixteen years of study of that group is to be published by the U. S. Geological Survey. His more recent work on the elephant, horse and rhinoceros families has confirmed his theories of the origin of species. By the application of his principles it is possible to predict when and where an animal of a new species or genus may appear and what form it will take. So when Professor Osborn

picks up fossils of unknown mammals in Mongolia, he is able to compare them directly with fossils found in France or the Rocky Mountains as to stage, rate and direction of their development. His results directly contradict the theories of the vitalities, for they demonstrate that all mechanical characteristics represent adaptive reaction to long continued experience.

Continuity is the fundamental principle of his theory of evolution in opposition to the discontinuous theories recently in vogue. He would retain Darwin's principle of natural selection, but reject the idea that useful characteristics were developed from minute accidental variations in all directions. This is replaced in Osborn's theory by the "Principle of rectigradation of adaptive organs," according to which variations originate directly in the germ-plasm and develop in long ages in an adaptive direction until they finally obtain survival value in the struggle for existence.

A possibility of escape from the iron bonds of heredity was suggested by Dr. Oscar Riddle, of the department of genetics of the Carnegie Institution. He has proved that even sex can be completely reversed in adult pigeons and frogs by special conditions, although sex has been supposed to be determined at the start by the way the chromosomes unite in the germ cells. Since other physiological and psychological characteristics are transmitted the chromosomes "we may in the far distant future be able to choose which of the two factors we may permit to develop." Dr. Riddle has found by experiments on pigeons that when the thyroid gland becomes more active the body processes are speeded up. In autumn and winter the thyroid glands are larger than in spring and summer, and when they are larger the eggs laid produce a higher proportion of males.

That complete sterility may be caused by improper diet has been demonstrated by Professor H. M. Evans, of the University of California. He has found the anti-sterility Vitamin E most abundant in wheat germ and has been able to extract it in the form of a thick yellow oil of remarkable potency. A minute drop of this, weighing only a third of a milligram, given daily to a male rat, fed on a diet devoid of Vitamin E, will keep him normal throughout life and a slightly larger amount will enable a female rat to produce and rear litters of young. A larger amount than the essential minimum has no effect. Vitamin E is not destroyed by drying or cooking and is active in the dried leaves of lettuce, alfalfa, peas and tea.

WIRE STORIES ON THE MEETING OF THE AMERICAN PHILOSOPHICAL SOCIETY

By Watson Davis, Managing Editor of Science Service

Man and all living material is mere jelly, elastic as rubber, fibrous and thirsty for water. This is the character of protoplasm, the stuff of life, whose properties have been discovered through actual dissection of microscopic living cells performed by Dr. William Seifriz, National Research Council Fellow, at the University of Pennsylvania. He told the American Philosophical Society at its opening meeting at Philadelphia on April 23 that this fundamental stuff of all life most closely resembles gelatine, rubber, soap and casein. Dr. Seifriz explained how he had discovered that protoplasm is just as springy as a rubber band. Under a powerful microscope a minute particle of nickel only 1/2500th of an inch across was inserted into the heart of a living cell. Attracted by an electro-magnet the metallic particle stretched the protoplasm and when the magnetic influence was removed the particle jumped back into its original position.

The man who has penetrated the depths of space farther than any one else living or dead told the American Philosophical Society on April 24 about the evolution of great stellar systems now taking place at distances so remote from the earth that it takes light millions of years to travel here at the rate of 186,000 miles a second.

He is Dr. Edwin P. Hubble, astronomer, who, with the aid of the largest telescope in the world, the great 100-inch, on Mt. Wilson, California, has proved that minute patches of light, most of them not even visible to the naked eye, are actually great universes of stars, similar to the Milky Way, that can be seen crossing the sky on a fine, clear night. That great eight-foot mirror, collecting faint light from distant nebulae and imprinting it on photographic plates, has demonstrated that these seeming gaseous clouds are in part composed of stars, many of them more gigantic than our sun.

Dr. Hubble's researches furnish us with the material for reconstructing the history and development of our own stellar system in which the earth is a mere dull dot and the sun but a faint insignificant light. First, if we may judge by these other stellar systems just discovered by the astronomer, our universe was an irregular conglomeration of stars and nebulosity. As the universe grew older it became more regular, it took on a spiral form, great arms of stars shot out in a sort of pinwheel shape and finally the great mass of stars assumes a disc like shape similar to that of our Milky Way. Out in the great laboratory of the heavens such processes are now going on. Dr. Hubble said that in the great nebula in the constellation of Andromeda, 23 new stars had blazed forth in the last two years, indicating that things are moving faster there than in our own system.

Testimony on a solar mystery was presented by Dr. Heber D. Curtis, of the Allegheny Observatory, who told the scientists that he had discovered in the hitherto unexplored red region of the coronal spectrum a line that may be evidence of "coronium," the hypothetical sun element not yet discovered on earth or elsewhere in the universe. The gaseous corona or envelope around the earth's favorite star, the sun, came in for close scrutiny during the total solar eclipse last January when Dr. Curtis joined the expedition of Sproul Observatory, described in an address by the leader, Dr. John A. Miller, of Swarthmore. Dr. Curtis warned the scientists, however, that what is now called coronium may be some other element such as hydrogen, helium, calcium or magnesium, in masquerade.

Study of the earth to learn about the sun was advocated by Dr. Louis A. Bauer, director of the Carnegie

Institution's magnetic observations. He has found close correspondence between sunspots and the magnetism of the earth.

An attack on the white plague is being made with the aid of X-rays. Dr. F. Maurice McPhedran, of the Phipps Institute, told the scientists of a new device employed to take diagnostic X-ray photographs of the lungs. In the past, the motion of the heart and lungs during exposure caused a loss of detail. An electrical engineer at the University of Pennsylvania, Charles N. Weyl, aided Dr. McPhedran in designing an apparatus which overcomes this disadvantage. Between successive heart beats there is a period when the heart is at rest, but this is too brief to permit a fully timed exposure.

So Mr. Weyl makes the exposure on the installment plan during the intervals between several succeeding beats. A small glass funnel is placed over the artery on the side of the patient's neck, and as the blood rushes through it the pulse formed causes a slight pressure in a rubber tube. This acts on a small sheet of rubber, to which is attached a tiny mirror. As the rubber moves, the mirror is turned and a beam of light from a powerful incandescent bulb is reflected to a photoelectric cell, a device which gives an electric current when illuminated. Radio vacuum tubes amplify this current many thousands of times, and the amplified current is used to operate a relay which in turn makes the X-ray exposure at the proper moment.

The pressures of outflowing sap in wounded trees at this time of year may be as high as 150 pounds per square inch, equal to the steam pressure in an ordinary locomotive. This has been discovered by special instruments placed in tree trunks by Dr. D. T. MacDougal, director of the Carnegie Institution's Department of Botanical Research. Dr. MacDougal also told the society that trees with dead roots, trunk and leaves still continue to experience an ascent of sap in spring, demonstrating that this seemingly vital process is purely mechanical.

Queer green plant algae that live and thrive in complete darkness nine feet deep in the soil are being investigated by Dr. George T. Moore, director of the Missouri Botanical Garden, St. Louis. In spite of the fact that millions of them inhabit a clump of earth, their true function in life is unknown. One species of these subterranean algae is surprisingly ubiquitous. Dig a hole three or four feet deep in any part of the world and there the algae can be found.

The great menace of coal smoke to people and plants was the subject of another paper by Dr. Moore. From automatic dust counts he has figured that the average city dweller would gain 25 to 35 pounds of weight each year if the body retained all the soot and dirt that was breathed in. Raising of roses, violets and other flowers has been rendered impossible in some places by poison gas attacks due to coal smoke containing damaging amounts of acid. Most of the smoke nuisance is caused by home furnaces rather than power plants, he discovered.

Mountains floating on a sea of dense liquid glass, continents migrating over the face of the earth and volcanoes being formed by landslides of the earth's crust—such is the new picture of earth and mountain building presented to the American Philosophical Society by Professor Reginald A. Daly, of Harvard University.

It was once thought that the earth was a molten ball of fiery material with only a very thin crust between man and realistic hellfire. That idea has been abandoned because astronomers and physicists have discovered that the earth is actually more rigid and heavy than steel.

But the geologist is returning to the idea of liquids within the interior of the earth. Thirty to sixty miles deep, Dr. Daly believes, is a layer of liquid glass, under great pressure, so rigid that if it could be seen it would look like rock and yet it is so mobile that the very continents float and slide upon it. Both mountains and volcanoes owe their origin to landslides of great blocks of the earth's crust riding on this great subterranean sea of glass. The crumpling on the down side of a great slide caused mountains to rise and allowed great overflowings of the lava and gave birth to volcanoes.

North America in migrating slightly westward in ancient times caused the Rockies with their Mt. Shasta and Mt. Rainier to form, while the Alps, with the southern European volcanoes, were created when Europe decided to cuddle up closer to Africa by about 200 miles.

A great juggler of atoms and electrons, Dr. Robert Andrews Millikan, Nobel prize winner and director of the Norman Bridge Laboratory of Physics at Pasadena, California, announced that important laws in X-rays can now be applied to the kind of light that is visible to the human eye. By treating certain metals and gases to intense bombardment with 2,000 to 3,000 ampere sparks at 40,000 volts, Dr. Millikan can easily strip atoms of their planetary electrons that circle about the central nucleus. Within that miniature atomic solar system, an earth is suddenly flung off into space with an immense force. When an atom has lost an electron in this way, Dr. Millikan has found that it flies a flag, as it were, by arranging its spectral lines in a definite and unmistakable manner. It will be possible to tell just how many electrons have been lost by atoms in the stars as a result of Dr. Millikan's work.

The great family of Proboscidea, in which the modern elephant, his ancestors and his kin belong, was declared by Dr. Henry Fairfield Osborn, president of the American Museum of Natural History, New York, to rival man in its migrations and adaptations. Fastidiousness about food led the elephants to choose the same general locations selected by man and the horse for their habitat, he said, in pointing out that although the elephant roamed America millenniums before the days of circuses, his original home was in Africa.

A hundred million years ago, many millions of years before man himself appeared on the earth, there grew a forest, near what is now Gilboa, New York. Dr. John M. Clarke, New York state geologist and paleontologist, pronounced this grove the oldest known forest. He has resurrected it from the remains in the rocks and he finds those ancient trees to have been much like modern tree ferns, probably attaining heights of 50 feet or more.