

PHYSICS

Unit of Magnetism Studied; Light Becomes Tired Is Theory

American Physical Society at Washington Meeting
Also Discusses Mountains and Cosmic Radiation

AN experimental method for studying one of the basic units of magnetism—called magneton—was described at the meetings of the American Physical Society in Washington, D. C., by Prof. O. Stern of the Carnegie Institute of Technology.

He suggests that whereas a beam of molecules moving horizontally will gradually fall, due to gravity, like an artillery shell fired level, it is possible with a similar beam of magnetic molecules to suspend them, in their flight, by the repulsion of a nearby magnetic field.

Prof. Stern shoots his molecular beam down a tube and beneath the tube he places, parallel, a wire carrying current. The magnetic field of this current is used to balance the fall of the molecules as they go along. He is able to determine the current which will just hold the beam in its level line and from this can calculate the force of magnetism in a single unit magneton.

"Tired" Light

A cosmic Marathon race in which "tired" light wearily struggles onward through space was described by Prof. Arthur Haas, noted theoretical physicist of Vienna who is now at the University of Notre Dame. He advanced the tired light hypothesis to explain the observed red-shift of the light from distant nebulae which has up to now been interpreted as indicating a universe blowing itself apart in expansion.

To accept the nebular red-shift as due to expansion from some central point in remote times one has to agree, said Prof. Haas, that the limit of the universe is about 500 million light years in distance. This is the distance which light, traveling at 186,000 miles a second, would speed in 500 million years. Also, added Prof. Haas, one has to agree that the matter in this expanding world of limited extent is dissolving.

The trouble with the expanding universe picture is that present telescopes like the great 100-inch diameter instrument at Mt. Wilson observatory can peer into space just about 500 million light

years and thus astronomers might feel that perhaps they are already seeing to the limits of the universe. Few of them, of course, feel that present instruments have reached the limit. Therefore, the universe probably is much larger.

Prof. Haas' "tired" light suggestion to explain the red-shift which is observed in the light from distance nebulae says that as the little bundles of light energy known as quanta speed to the earth they suffer a loss of energy. In a sense they are like a man running who becomes more and more tired with the loss of energy. This "tiredness" of light quanta means they have less energy and this in turn is observed as a shifting of the light rays toward the red end of the spectrum. Thus a quantum of violet light has more energy than a quantum of blue light and a change from violet to blue color is a shift toward the red. Actually the light is not necessarily red in color as is sometimes erroneously suggested.

The virtue of Prof. Haas' suggestion is that it appears to explain the observable facts of nebular astronomy without encountering technical theoretical difficulties which have risen, in the last few years, to plague the popular expanding universe concept.

Side Thrust

A theory of mountain formation in the earth which gives quantitative agreement with the known heights of mountain ranges throughout the world was proposed by Dr. Ross Gunn, technical adviser of the U. S. Naval Research Laboratory.

The theory is an outgrowth of Dr. Gunn's earlier calculations on the side-thrust occurring along the shores of deep oceans like the Pacific. This thrust, he has already reported, is probably caused by the uneven density or lopsidedness of the earth.

This uneven formation of the earth is explained if one accepts Dr. Gunn's earlier hypothesis that the solar system originated when a huge star split into two parts; one of which became the sun and its associated planets and the other

became lost by journey out into space.

The planets splitting off from the sun were hotter on one side than on the other, reasons Dr. Gunn, and this temperature difference accounts for the unequal distribution of material on the surface of the earth. Once the uneven distribution is assumed the movements of earth masses by the varying gravitational pull of the different parts can be used to explain the upthrusting that eventually has created the great mountain ranges.

Cosmic Ray Variation

Evidence that cosmic rays have a small variation in their intensity throughout the day and attain a maximum value at about eleven o'clock in the morning was reported by a Carnegie Institution of Washington scientist, Dr. S. E. Forbush, of the Department of Terrestrial Magnetism.

The daily, or diurnal, effect is very small but persistent throughout observations carried on continuously for 360 days. It amounts to less than two tenths of one per cent. of the total radiation (.17 per cent.). In general and except for minor particulars, it confirms the findings of the noted Austrian scientist Prof. V. F. Hess of Innsbruck, who was in 1936 awarded the Nobel Prize in Physics jointly with Dr. Carl Anderson. Prof. Hess for some years has been carrying on continuous studies of cosmic ray intensity and noted a daily shift in the intensity. If these results are quantitatively substantiated by observations made at other stations and are accepted by other scientists, then a satisfactory theory for the cause is required. This requirement may throw some light upon the origin of at least a small part of the radiation in cosmic rays. Further observations are being taken at Carnegie Institution's magnetic observatory at Huancayo, Peru.

Accelerating Tube

The 24-foot long accelerating tube for the giant 5,000,000 volt electric generator of Massachusetts Institute of Technology at Round Hill, Mass., has been

● RADIO

May 11, 4:15 p. m., E.S.T.
THE GRASSHOPPER PLAGUE—Dr. W. R. Walton of the U. S. Bureau of Entomology and Plant Quarantine.

May 18, 4:15 p. m., E.S.T.
THE SUPERIOR CHILD—Dr. John E. Bentley of the American University.

In the Science Service series of radio discussions led by Watson Davis, Director, over the Columbia Broadcasting System.

completed and tested, Prof. Robert Van de Graaff and Drs. C. M. and L. C. Van Atta told the meeting.

The towering spheres that store up electric voltages in the airship hangar at Round Hill have been completed and tested for some time but the designed use of the huge equipment for atomic bombardment experiments has been delayed until the accelerating tube was finished.

The tube rests, high in the air, on a special I-beam made of bakelite-impregnated plywood. Each of its four sections contains 12 porcelain cylinders and eleven steel electrodes which gradually accelerate the particles passing down their axes from voltages supplied by the collecting spheres at each end. In use the tube is evacuated. Arrangement has been made to focus the beam of charged particles as they speed down the tube to the target so that the beam will not spread out and hit the walls of the tube with destructive effect.

Science News Letter, May 8, 1937

ASTRONOMY

Places Last Bolt in Frame Of 200-Inch Telescope

See Front Cover

THE FINAL bolt in a spiderweb of steel which will finally become the mounting for the world's largest telescope has been turned into place at the turbine plant of the Westinghouse Electric and Manufacturing Company.

Dr. Robert A. Millikan, Nobel prize winner and chairman of the executive council of California Institute of Technology at Pasadena, attended the culminating act of fitting the final part of the mounting which will have a total weight of 900,000 pounds. Thus the

second stage in the fabrication of the biggest "eye" of astronomy was finished. The great glass disc for which the mirror of the huge telescope has long since been cast and is now being ground is already in the workshops of Caltech, gradually being fashioned—"figured" as astronomers say—to its proper curvature. The completed telescope: mirror, mounting, observatory building and auxiliary equipment, will cost \$6,000,000 when finally put in operation in 1940. Funds were made available by the Rockefeller Foundation for the project.

The operation of the 200-inch telescope will be in charge of scientists at California Institute of Technology, and plans have been made for close cooperation with the present Mt. Wilson Observatory of the Carnegie Institution of Washington which houses the 100-inch telescope that is, today, the world's largest.

The tube of the telescope, at the bottom of which will be placed the 200-inch diameter mirror, has a total length of 60 feet—as high as a six-story building. It was made in sections, the largest of which is 22 feet wide and 12 feet high. A special annealing furnace had to be built to heat this unit after fabrication so that the internal stresses could be relieved. Although large, this piece weighs only 26,000 pounds. Heaviest unit is the central section of the horse-shoe yoke of the mounting which weighs 120,000 pounds.

Oil Bearings

The weight of the entire telescope will rest, and float, on special oil bearings which will enable the instrument to be turned easily with a very small force. Previous mountings of telescopes have been on pools of mercury.

The three major units of the mountings, their size and weight, are:

1. The tube, which is 22 feet one inch in diameter and 45 feet long, with a total weight of 150,000 pounds.
2. The cage, which is 22 feet one inch in diameter and 12 feet long, weighing 26,000 pounds.
3. The horseshoe yoke and side girders, weighing 370,000 pounds, with a maximum dimension of 46 feet and a thickness of four feet.

The total weight of the mounting is 900,000 pounds, or 450 tons.

Science News Letter, May 8, 1937

The only great ape that walks erect habitually is the gibbon, which rates as the least intelligent and least man-like of the apes.



Dinosaurs—and Others

ISN'T IT ODD, how we have fallen into the habit of regarding all extinct reptiles as dinosaurs—if only they were big ones!

Dinosaurs, to be sure, probably were the dominant forms of all reptile life that has ever inhabited the earth. They really were the bosses of the land, back in the geologic ages which scientists group together under the name of Tertiary Period, which has been called for convenience the Middle Ages of animal life. Dinosaurs were both big and varied, they included both plant-eating and flesh-eating forms, they developed such fantastic extremes as the carnivorous biped tyrannosaurs, the mountain-bodied but pin-headed brontosaurus, the freakishly-horned triceratops.

But not every reptile of those far-gone days was a dinosaur. The swimming forms that ruled the sea, the plesiosaurs and the ichthyosaurs, were not properly dinosaurs. They belonged to quite distinct groups or orders of animals, just as among modern insects flies and bees belong to quite distinct groups even though they may look somewhat alike.

Similarly, the flying reptiles that for a time held the lordship of the air were not flying dinosaurs. So far as is now known, no dinosaur ever flew. These early fliers belong to a group of their own, usually called the pterosaurs, which means merely winged reptiles. Nor were the pterosaurs the ancestors of birds. Birds did originate during the Age of Reptiles, and the first birds were astonishingly reptile-like, but they came of a different ancestral stock.

The reptiles of the Tertiary included some types that are still in existence today, notably the turtles and the crocodiles. These came in all sizes. There

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