

## SCIENCE NEWS

*Science Service, Washington, D. C.*THE WASHINGTON MEETING OF THE  
AMERICAN PHYSICAL SOCIETY

PROFESSOR ARTHUR HAAS, of Vienna, who is now at the University of Notre Dame, advanced a hypothesis to explain the observed red-shift of the light from distant nebulae which has 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 that the limit of the universe is about 500 million light years in distance and that the matter in this expanding world of limited extent is dissolving. Professor Haas's "tired" light hypothesis to explain the red-shift which is observed in the light from distant nebulae suggests 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 that 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.

PROFESSOR H. P. ROBERTSON, of Princeton University, described calculations on the dynamical effects of the sun's radiation on small pieces of matter up to one or two inches in diameter. These calculations show that the effect of the radiation which a particle of matter might receive from the sun and which is then given off by the particle has the net result of retarding the orbital velocity of the particle about the sun. This slowing down, in turn, has the effect of gradually drawing the particle nearer and nearer to the sun until it is finally drawn into it. Thus solar radiation is an agency for clearing the neighborhood of the sun of small particles by sweeping them into it.

A WAY of seeing in the laboratory what may be happening far down deep in the earth where the enormous pressures change matter into forms of strange characteristics was described by Dr. Robert B. Jacobs, of Harvard University. In his experiments crystals of materials like gold iodide were studied by x-rays while they were subjected to pressures as great as 60,000 pounds to the square inch in special steel chambers. Because the steel would ordinarily mask any possible knowledge of the much more transparent crystals inside, a special window of beryllium was fashioned in the walls of the compression chamber, and through this window the x-ray studies were carried out. The gold iodide crystals at the high pressures were found to have a structure quite similar in design to that of common table salt.

PROFESSOR O. STERN, of the Carnegie Institute of Technology, described an experimental method for the study of one of the basic units of magnetism, the magneton. He suggests that whereas a beam of molecules moving hori-

zontally 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 near-by magnetic field. Professor Stern sends a 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, and it is possible to determine the current which will just hold the beam in its level line. From this the force of magnetism in a single unit magneton can be calculated.

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 Dr. S. E. Forbush, of the department of terrestrial magnetism, Carnegie Institution of Washington. 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, the findings of Professor V. F. Hess, of Innsbruck, who, in 1936, was awarded the Nobel prize in physics jointly with Dr. Carl Anderson, were confirmed. Professor Hess for some years has been carrying on continuous studies of cosmic ray intensity and has noted a daily shift in the intensity. If these results are quantitatively substantiated by observations made at other stations and are accepted by other investigators, 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 the magnetic observatory at Huancaayo, Peru.

HENRY W. KNERR, of Pennsylvania State College, reported that the continual pushing of the radio wavelengths to shorter and shorter values has now made it possible to investigate the structure of water with radio waves from two to eight inches long. The bending of such short radio waves is much greater in water than is the bending of light waves. The index of refraction is about 1.6 for light and was measured as 8.79 for the radio waves used.

THE fact that a wave of electrical potential has a different speed, depending on whether it is of positive or negative sign, was reported by Professor J. W. Beams and Drs. L. B. Snoddy and J. R. Dietrich, of the University of Virginia. The speed of potential waves in a tube some fifty feet long were measured, even though the waves were traveling about 120,000 miles a second. The negative impulses were found to travel twice as fast as the positive impulses.

ANOTHER element rendered strongly radioactive by atomic bombardment was reported by Dr. Harold Walke, of the University of California. Significant is the fact that much of the radioactivity comes in the form of gamma radiation such as radium gives off. Titanium was the metal bombarded and the radioactivity is believed to

be caused by the formation of isotopes of titanium and vanadium. One radioactivity decay had a half life of nearly sixteen hours and another of over sixteen days. Dr. Arthur H. Snell, of the same laboratory, also reported bombardment of bromine with deuterons. A radioactive form of this element, which had a half life of 35 hours, was accompanied by the liberation of gamma radiation.

STUDIES on magnetic single crystals of pure iron and a special nickel-iron alloy were described by P. P. Cioffi, H. J. Williams and R. M. Bozorth, of the Bell Telephone Laboratory. Pure iron had a high magnetic permeability of 680,000. The alloy, however, had a permeability of almost twice as much—1,040,000.

PROFESSOR ROBERT VAN DE GRAAFF and Drs. C. M. and L. C. Van Atta reported that the twenty-four foot accelerating tube for the five million volt electric generator of the Massachusetts Institute of Technology at Round Hill, Mass., has been completed and tested. The towering spheres which store up electric voltages in the airship hangar at Round Hill have been completed and tested some time ago, but the use of the 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 twelve 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.

A CASE in which two separated electrical contacts built a metallic bridge between themselves was described by G. L. Pearson, of the Bell Telephone Laboratories. Electrodes of gold, steel and carbon were used in the study, separated by the real but small distance of two millionths of a centimeter. When a potential of about 10 volts was applied on the two contacts, it was found that the electrostatic force created was sufficient to pull the material from the electrodes so that it bridged the gap and allowed the current to flow.

A THEORY of mountain formation in the earth which gives quantitative agreement with the known heights of mountain ranges throughout the world was described 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 is probably caused by the uneven density or lopsidedness of the earth. This unequal 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, 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 world's great mountain ranges.

A TINY, compact battery which weighs less than two pounds and yet will deliver 1,000 volts was described by Willis E. Ramsey, of the Bartol Research Foundation of the Franklin Institute. The battery will keep indefinitely when not in use because it is completely dried and sealed in an airtight box. When operation is desired a few drops of ammonium chloride are applied and its high voltage is obtained. After use it is again dried. The original purpose of the equipment was to supply high voltage without undue weight in the cosmic ray measuring apparatus sent aloft on unmanned small balloons by Bartol scientists.

IT is proposed to separate isotopes by whirling them in centrifugal force fields of some 10,000 times that of gravity, according to Professor O. Stern, of the Carnegie Institute of Technology. This is done by balancing the effect of the centrifugal force for a given mass by applying an external magnetic field. In this condition molecules slightly heavier gradually seek the outward path while the lighter ones stay in their previous path. A suitably placed collector separates the two isotopes.

A MODEL of the bones in the human ear which transmit the vibrations of the ear drum to the inner ear, where nerves pick up the energy and conduct it to the brain, was discussed by Professor Otto Stuhlman, Jr., of the University of North Carolina. The model studied was an exact copy of the ear bones magnified twenty-four times their natural size. The three bones, malleus, incus and stapes, form a complex system of levers and joints having frictional bearing surfaces that distort the sound waves. Their inward motion is even different from their outward motion. Their action is compared to a radio tube amplifier with a non-symmetrical characteristic. It was shown that part of the beautiful effects of musical tones is due to subjective tones added to the musical tone by the complex motion of these middle ear bones.

#### THE WASHINGTON MEETING OF THE AMERICAN GEOPHYSICAL UNION

GREATER safety for planes, their pilots and their passengers, is sought in a program of research for small high-flying balloons proposed by Professor Charles F. Brooks, of Harvard University. These small unmanned balloons, carrying featherweight, ultra-shortwave radio sending sets, will soon be ascending in scores and hundreds daily from weather observatories everywhere. They can gather and report weather data at altitudes of 20,000 feet or more, beyond the reach of human fliers except at unjustifiable expense. Professor Brooks laid out a seven-point research program, which he recommended for the adoption of meteorologists interested in upper air phenomena, and which will also have its applications in ground-level weather studies. Among his points are: study of extent, heights, shapes of fogs and cloud masses and their chances of clearing up; types and causes of "rough air"; fronts of contact between warm and cold air masses, with especial attention to lightning and to

winds that "go straight up"; ice conditions, their extent and height; high-altitude observations, with a view to better forecasts; hurricanes and typhoons; variations in ultra-shortwave radio transmission in relation to atmospheric stratification and fronts.

DR. H. U. SVERDRUP, director of Scripps Institution of Oceanography, reported a cooperative research program participated in by the institution and the California Fish and Game Commission, which includes the releasing of 6,000 drift bottles at sea. Each bottle contains a paper stating where it was dropped overboard and requesting its return.

QUANTITATIVE measurement of the dim light that fish and seaweed live by is being undertaken with a new instrumental set-up devised by Dr. R. T. Young, of the Worcester Polytechnic Institute. This consists of a water-tight casing containing a photoelectric cell, which can be lowered into the water. At the same time a twin photoelectric cell in the boat registers the surface light. The difference between the two readings, after calibration, shows how much light the water absorbs.

DR. CHARLES G. ABBOT, secretary of the Smithsonian Institution, made a weather forecast in which he said, "We seem justified in expecting a recovery from drought conditions in the Northwest within a year or two, but a severe recurrence of them following the year 1975." This is based on the 23-year cycle in solar activities and weather on the earth. A double period, a cycle of 46 years, appears to be particularly important in precipitation. It seems to have recurred regularly, affecting tree-ring widths . . . for four centuries. Its recurrence is in nearly the same phase as the variations of level of the Great Lakes for the past century. The 23- and 46-year cycles have also appeared in temperature departures from normal in such widely separated regions as western Europe, South Africa and Australia.

How loud is an earthquake? This question was raised by Dr. H. Landsberg, seismologist at the Pennsylvania State College. The noises that accompany earthquakes, often terrifyingly loud and grinding, have never been adequately accounted for. They do not always appear to originate at the point of maximum disturbance, the earthquake's epicenter. It is also difficult to calculate the amount of earthquake energy diverted into the production of noise; calculations made by Dr. Landsberg indicate that only one ten-thousandth of the energy of the shock waves can pass into the air as sound waves. It would be possible to record the energy of the earthquake noises in terms of decibels. However, the necessary sound-recording instruments are unlikely to be available when an earthquake occurs. For this reason, Dr. Landsberg proposed a five-grade comparison scale for auditory comparison: (1) Whisper, or rustling of paper. (2) Conversation, quiet car moving at low speed, slight knocking. (3) Distant thunder, distant artillery fire, distant drums, church bells, rumbling inside slow-moving train. (4) Heavy thunder, noise in slow subway, train in tunnel, avalanche, artillery fire, waterfall. (5) Near-by explosion, quarry blast, noise in airplane, collapse of building.

A NEW device for measuring sky blueness was described by Drs. H. Landsberg and H. Jobbins, of the Pennsylvania State College. It is considered an advance over the series of standard color cards hitherto employed, being more rapid and direct in use and having no abrupt jumps from one degree of blueness to another. The device consists of a wedge of clear blue glass of a standard hue, mounted so that sunlight is reflected through it from a mirror. Half the opening of the frame in which it is mounted is open, so that the observer can look at the sky and then slide the wedge along until the color matches. The deeper the blue, the thicker the part of the wedge needed to make a correct match. In trial observations, it has been found that the bluest part of the sky offers the best visibility; a pale sky means poor seeing. The part of the sky 90 degrees of arc away from the sun and on the opposite side of the sky is usually the deepest blue.

A MAP was shown at the meetings by Drs. Charles W. Brown and Wyndham O. J. Roberts, on which the number of tornadoes during a fifty-year period have been marked and isotorns, lines of equal tornado frequency, have been traced. This was not easy, for some counties are tornadoless islands in the midst of areas of rather high tornado frequency. The map shows that the tradition that all of Kansas and other western states are "cyclone country" is unfounded. The higher, drier parts of the plains have relatively few tornadoes; only when one gets into regions of higher rainfall do the twisters begin to make a formidable showing. Other regions of low tornado frequency are the northern border of the central region, the seaward margin of the coastal plain from Texas to New Jersey, and the Appalachians from hilly Georgia to New England.

DR. CARL I. ASLAKSON, of the U. S. Coast and Geodetic Survey, described an automobile trailer that has been fitted up as a laboratory for the study of differences in the earth's gravity in different localities. Such apparatus as radio, chronograph, amplifiers, chronometer and batteries are permanently installed in it. In studying the local differences in gravitational attraction, the swing of an accurately measured pendulum is automatically clocked against the Arlington radio signals. The pendulum swings faster or slower than "standard" rate, depending on the location and density of major rock masses in its vicinity.

THE REVEREND JAMES B. MACELWANE, S.J., of St. Louis University, spoke on the action and causes of deep focus earthquakes—and of the mystery that still surrounds them. Some of these deep earthquakes occur as much as 700 kilometers, or more than 400 miles, beneath the surface. Yet they seem to be set off in essentially the same way as earthquakes much nearer the "top," that is, by the gradual piling up of a condition of strain, until something has to snap. The fact that there is something that far down that can snap appears to be an argument against the old notion that the earth's interior is all a fiery fluid; for fluids can't snap, only solids, or something very nearly solid, can do that.