SCIENCE NEWS

Science Service, Washington, D. C.

RED-SHIFT IN LIGHT FROM COSMIC SOURCES

THE theory of cosmogony of the expanding universe, which postulated some primeval explosion that sent the stars and galaxies rushing apart, was critically discussed at the scientific meetings at the University of Notre Dame, on January 10, honoring the memory of the chemist and botanist, Father J. A. Nieuwland, whose basic discoveries led to the development of synthetic rubber-like compounds.

Professor Arthur Haas, Viennese theoretical physicist now on the staff of the university, presented mathematical arguments and calculations showing that the famous observed red-shift of light from the distant nebula can hardly be due to an expansion, or rushing away, of these cosmic bodies from some central point. The interpretation of the red-shift as due to a velocity of motion has been the backbone of the expanding universe theory so often associated with the name of Abbé G. Lemaître, the Belgian scientist-priest. Professor Haas calculated the amount of energy which matter can create in a unit volume of the universe and finds it far too little to overcome the gravitational attraction that must be overcome if the different parts of the known universe are rushing away from one another in a super-expansion. Professor Haas supported his arguments by also making calculations showing the amount of energy per gram of matter which would be required to double the mutual distances between nebulae in a system of mutual density. His conclusions from this calculation were:

"A nebular system which exhibits the average mass density observed in the extra-galactic region and which has already experienced a doubling of its linear dimensions, can not possess a radius of more than about 6,000 million light years. This result seems remarkable because, if in the nebular system there is any expansion at all, we must assume that at least a doubling of the linear dimensions has already taken place. This conclusion can not be evaded since a doubling requires only 1,300 million years, whereas the age of some terrestrial minerals was found to be 2,000 million years."

If astronomers abandon the idea that the reddening of the light from the distant nebula is due to their velocity of expansion then some other concept must be introduced to account for the observed red-shift. Somehow or other the light from these far-away nebula has to lose energy *en route* so that its color is slightly redder than it was when it started. One idea would be that intergalactic dust in the path would absorb some of the light ray energy. But Professor Haas demonstrated by calculation that the loss of radiant energy is of the same order of magnitude as the energy-production of matter. And he concluded by showing that every photon of radiant energy—whether it has high energy and short wave-length like an x-ray or low energy and a long wave-length like a radio wave—loses the same energy in traveling one single wave-length. This concept would account for the observed red-shift in light from distant cosmic sources.

PHOTONS

GHOSTS have often been suspected of being at the bottom of strange happenings on this earth. But the main claim of the modern scientist is that he has dispensed with such supernatural explanations for earthly events. In the world of modern science a ghost would indeed be a lonely individual! Nevertheless, some of those fundamental entities of which the material world is believed to be composed behave in a very very strange way. Those "bundles of energy" called photons are perhaps the worst offenders. Even the physicist is somewhat at a loss when it comes to explaining the antics of a photon. And as far as the layman is concerned—well, perhaps a photon is as much like an old-fashioned ghost as it is like anything else!

Such seems to be—for purposes of popular explanation—the view of Dr. W. F. G. Swann, of the Bartol Research Foundation who, speaking informally at the Franklin Institute recently said:

"A bullet is a kind of thing which can only be at one place at once and which strikes where it is. The electrons and protons (material particles) are like bullets. A ghost is a creepy kind of thing which can be everywhere always, which only strikes at one place at a time, but which can strike anywhere." And this unpredictable, ghostly, kind of behavior is characteristic of a photon.

Carrying the analogy still further, the speaker went on to describe how these photon-ghosts terrify the inhabitants of the atomic world. Particularly potent in this respect are the high-powered ones which accompany the cosmic rays. When an especially horrendous photon-ghost meets up with an unsuspecting atom, except for a severe "mathematical fright," the atom comes through the ordeal without serious harm. But the ghost himself may be so dreadfully annoyed that he actually materializes—comes to life—in the form of particles of matter. New-born "particles with a punch" are formed which go tearing through the atmosphere ripping the outer structure off other atoms.

A NEW PROPERTY OF MATTER

WHAT may be an entirely new property of matter has been discovered in one of the world's rarest minerals known as "Hackmanite." Found originally in the rugged fiords of Greenland in the early years of the last century and later in the old crater of Italy's volcano Vesuvius, Hackmanite has long been a treasured collector's piece for scientific museums, for its rarity alone. Now a clear variation of the deep blue, lapis lazuli-like mineral may take on the added merit of research value.

The American mineralogist, O. Ivan Lee, of Jersey City, N. J., has made the strange discovery that a

quickly passing red-violet colored streaking of the surface of Hackmanite can be revived at will by radiating the mineral with ultra-violet rays. For many years mineralogists have known that when a clear variety of Hackmanite was fractured, characteristic and beautiful bright red-violet splashes of color appeared on the clean surface. Then, on exposure to ordinary light, they passed away. Radiation with ultra-violet light, Mr. Lee has found, brings back this lost property at will and as many times as one wanted to perform the experiment.

The first thing which one might think of to explain this strange revival of a color-death would be fluorescence. But this phenomenon is not fluorescence, at least in the ordinary sense of the term. The fluorescence of Hackmanite, that is, its brief temporary glowing following exposure to light, is a characteristic salmon pink that can not possibly be confused with the bright red-violet shade of the revived colors. Neither is the happening one of phosphorescence since this property of Hackmanite yields a beautiful blue color. What really is the true explanation of the effect is thus unknown at present, but at this stage of scientific research when supposedly the external properties of matter, at least, are well known, the discovery takes on added interest. Mr. Lee calls the phenomenon reversible photosensitivity.

Besides the Greenland and Vesuvius regions where Hackmanite is found, varieties of it have also been located on the Kola Peninsula in Arctic Russia and just recently in the province of Ontario, Canada, near Bancroft. The Academy of Natural Sciences Museum has now under shipment from Canada a specimen of this strange, rare mineral.

EFFECTS OF CARBON MONOXIDE GAS

RISKING their lives for the past six months in an effort to learn more about the effects on the human body of carbon monoxide gas, one of man's deadliest enemies, six "human guinea pigs" of the Harvard Fatigue Laboratory have found that the average man can stand the gas only until his blood is one-third saturated with it. At the same time they confirmed previous findings that very tiny concentrations of the gas can bring man to this breaking point. Only one part of the gas in a thousand parts of air, for example, breathed for half an hour or so, can render a healthy man unconscious. That is, if he is not active—if he is driving a car, for example. If he is exercising vigorously, he will succumb even sooner. They also added significant biological proof of a familiar lesson, a lesson emphasized by the mounting toll of deaths from carbon monoxide poisoning throughout the nation. It is the fact that the insidious poison gives absolutely no warning of its presence or even that it is stalking its prey.

Not only is the gas colorless and odorless, as has been known for some time, but in addition, it has been found, a man breathing it feels no ill effects, not even drowsiness. He just collapses without warning. If he is driving his car, if he is alone in a garage, he may well be doomed. Most dramatic proof of this was brought to the Harvard experimenters when Dr. W. H. Forbes, of the Fatigue Laboratory, suddenly fainted after he had just completed tests requiring a high degree of skill. Other workers had to carry him from the gas-filled chamber and revive him. His blood proved to be almost one half saturated with carbon monoxide. The experiments, conducted cooperatively with the Harvard Bureau for Street Traffic Research, were directed by Dr. David B. Dill, assistant directer of the Fatigue Laboratory; Dr. Harry de Silva, of the bureau; Dr. Forbes and F. M. Van Deventer, of the Cities Service Refining Company, whose survey to the effect that about five per cent. of automobiles and closed trucks examined on highways have dangerous concentrations of carbon monoxide led to the research. These men and two students volunteered for the tests.

The plan of the experiments was to admit the deadly gas in known concentrations and amounts into a closed room in which the subjects were being tested at regular intervals for their reaction time, judgment, perception and other automobile driving skills. Blood samples were also drawn at intervals to determine the percentage of saturation with the gas. In all experiments the subjects showed no decrease in skill even when their blood was about one third saturated and they were practically ready to collapse. Tests were limited to these simulated driving conditions, although it is hoped ultimately to extend the investigation to include tests directly concerned with the operation of automobiles.

FATE OF ALCOHOL IN THE BODY

THE alcohol that gets into a man's body after a cocktail party or on other occasions may be burned like food and thus disposed of. More likely, however, it is changed into some other substance which is either stored or used by the body. The exact solution of this problem of what the body does with alcohol remains a challenge to physiological chemists. Dr. Thorne M. Carpenter described in a lecture at the Carnegie Institution of Washington his own experiments which point to the conclusion that instead of being burned in the body, alcohol is converted into some other substance which may then be either stored or used.

Alcohol itself can not be stored by any organ. The amount present in any organ after drinking depends chiefly on the amount of blood circulating through the tissues of that particular organ. The highest amount of alcohol per unit of weight goes into the blood, after it has been taken into the body, and nearly as large an amount per unit of weight is found in organs well supplied with blood such as brain, kidneys, spleen, heart, lungs and liver. What happens to the alcohol between the time it gets into the blood and organs and the time it disappears from the body is the question scientists have yet to settle. Hormones, produced by the glands of the body, may be concerned in this alcohol question. Other investigators have found that injections of insulin, the diabetes remedy, make alcohol disappear very much faster than normal from the bodies of animals. In fact, the disappearance is so fast that it does not seem possible it could be due solely to burning of the alcohol.

Other conditions besides an excess of insulin may make alcohol disappear quickly, Dr. Carpenter suggested, adding that further investigation along these lines is needed.

Performance of muscular work did not hasten materially the disappearance of alcohol from the bodies of the men who drank measured amounts of alcohol. An hour's work on the ergometer did not work off all the alcohol. The only effect work or exercise could have would be to remove some of the alcohol by simple vaporization through the breath. But not very much alcohol is dissipated this way. Dr. Carpenter said that any such attempt to remove alcohol through increased ventilation "would require a perfect whirlwind through the lung in order to be really effective in diminishing the amount of alcohol in the body." Getting rid of alcohol by drinking large amounts of water also does not, in the light of Dr. Carpenter's experiments, seem a successful method. Gallons of water would have to be taken immediately after the alcohol, he found, in order to flush the alcohol out of the body. The amount of alcohol gradually diminishes by itself, he explained, and "there would be no point in taking large quantities of fluids when the alcohol had reached a low point." Other interesting points about alcohol were described by Dr. Carpenter. It is absorbed very rapidly, distributed very rapidly through the body, and has the unique characteristic of being identifiable in the body as long as any of it is left. Alcohol furnishes energy, the amount being between that furnished by fat and that furnished by sugars and starches. It can get into the body without being drunk, since it is very readily absorbed from the air by breathing.

A NEW 1,000,000 VOLT X-RAY MACHINE FOR CANCER RESEARCH AND TREATMENT

THE newest aid of science in the fight on cancer is the giant 1,000,000 volt x-ray machine of the Institute for Cancer Research at Columbia University. The uniqueness of the new development, which makes it an improvement over previous apparatus having a comparable voltage, is that it is completely housed in a large steel tank which is continuously evacuated. Both the voltage generating circuits and the x-ray tube are thus shielded from any possible accidental contact. Patients are protected, in addition, by four inches of lead which permits only a narrow beam of x-rays to strike them at the proper places for x-ray therapy. Five outlet openings for the rays are provided: four for patients and one that is reserved for research purposes. The cost of the apparatus was $25,000.

The pressing search of science for improved ways of splitting the atom and studying its intricate nucleus is directly responsible for the new Columbia x-ray machine. In 1934 Dr. D. H. Sloan, at the University of California, developed a similar apparatus for accelerating charged particles in atomic bombardment experiments. It was found, shortly, that by a simple change of only one essential part of the apparatus it was possible to make a highly compact and efficient x-ray machine of high voltage. Such an apparatus was built for the University of California Medical School and the present Columbia equipment is copied and improved in design over this prior equipment.

In operation the new type x-ray machine utilizes 15,000 volts of alternating current electricity and applies this to twin radio oscillator tubes generating radio waves 50 meters in length, in the shielding tank. The electrical circuit of these tubes is so designed that when resonance is obtained more than 200,000 watts of electrical power flows in the hollow copper tubes of the equipment. Swift-flowing streams of water help dissipate the great heat generated. Eight hundred thousand volts potential have been obtained in Dr. Sloan's original apparatus and it is anticipated that the Columbia equipment will go beyond this to 1,000,000 volts. Upper potential limit of the design is limited only by the effectiveness of cooling the enclosed apparatus. Potential 5,000,000 volts could be obtained with existing oscillator radio tubes if there were any way of cooling the apparatus and making it work without burning up.

ITEMS

THE "lost" Asiatic earthquake of Thursday, January 7, has been located in Tibet by scientists of the U. S. Coast and Geodetic Survey, working on data collected by wire and radio by Science Service. Its epicenter was in approximately 35.5 degrees north latitude, 97.5 east longitude. This is in the general region of the Kwen Lun mountains, and apparently in an uninhabited or sparsely inhabited area. The disturbance was exceedingly severe, so that if it had occurred in the neighborhood of any large settlements the toll in death and property destruction would have been heavy. Fifteen seismological observatories in the United States, Canada, the Philippines and China supplied the data. They are as follows: Pennsylvania State College; Seismological Observatory, Pasadena, Calif.; Franklin Institute, Philadelphia; University of Montana, Butte; Des Moines, Iowa, Seismological Observatory; the Dominion Meteorological Observatory, Victoria, B. C.; the Manila, P. I., observatory; the observatories of the Jesuit Seismological Association at St. Louis University, Canisius College, Fordham University, and Zikawei, China; the observatories of the U. S. Coast and Geodetic Survey at Tucson, Ariz., Sitka, Alaska, Honolulu, T. H., and Chicago, Ill.

A NEW and direct international air route between Moscow and the United States, that traverses Soviet and U. S. territory exclusively, is being discussed. The projected route would be about 10,000 miles long. With good airports and modern high-speed airplanes it could be traveled in 4 or 5 days. Crossing the sub-arctic regions of Siberia, this route has already been pioneered by the Soviet aviators Levanevsky, Levchenko, Molokov and others. From Moscow the line would run to Krasnoyarsk, or Irkutsk, thence to Yakutsk, then to Ayan, next to Nagayevo until Anadyr on the Pacific Ocean is reached. The planes would fly across to Nome in Alaska and then to Seattle *via* Fairbanks and Juneau. One advantage of the new air link is that it would provide communication between the capitals of the Soviet Union and the United States without the need of traversing the many frontiers of Europe or any other foreign countries.