SCIENCE NEWS

Science Service, Washington, D. C.

THE NATURE OF COSMIC RAYS

NEW confirmation that cosmic rays consist, in a large measure, of charged particles streaming down on the earth from outer space has been presented before the Franklin Institute by Dr. Thomas H. Johnson, assistant director of the Bartol Research Foundation, Swarthmore, Pa. Dr. Johnson recently returned from a cosmic ray expedition to Mexico where his party climbed the 14,000-foot peak of Nevado de Toluca, fourth highest mountain in the country.

Using heavy and elaborate apparatus which measures the intensity of cosmic radiation as it varies from zenith down to horizon, Dr. Johnson detected a greater intensity from the south than from northern directions. These results tie in with his previous discovery that cosmic ray intensity also is greater from the west than the east. Both results are explainable by previously developed cosmic ray theories of Professor Carl Stoermer, Dr. P. S. Epstein and Abbé Lemaître and Dr. M. S. Vallarta.

To explain the north and south difference of cosmic rays is the concept that the earth casts a magnetic shadow. Dr. Johnson states that, "Due to the magnetic field and to the fact that the rays are electrically charged, the orbits are curved, and, if the earth were transparent to cosmic rays, much of the intensity which would be observed at the earth's surface would be due to rays which had previously been inside the earth. From inside the earth they would be turned back by the magnetic field into the region above the earth where they would again be turned down to the observer. Rays traveling such orbits as these are, of course, stopped at their first entry into the earth's surface and their absence on the remainder of their hypothetical path, appears as a complete shadow from the directions below the horizon and as a partial shadow from directions above the horizon. The partial shadow is the more dense, according to experiment and theory, from northerly directions than southerly directions in the northern hemisphere."

OBSERVATIONS OF NOVA HERCULIS

FROM observatories throughout the world, astronomers are hurrying the study of Nova Herculis, the exploding star which shone so brightly at Christmas time. Their hurry is a race with stellar happenings on the distant star which blew up; a race which will be lost if the star fades to its former insignificance in the heavens. At Christmas time Nova Herculis was so bright only sixteen stars in all the sky were more luminous. Now it has faded out somewhat and rapid work is necessary to obtain information about it before it dies out completely.

From the international "clearing house" for stellar data at the University of Copenhagen, Science Service has just received reports obtained at observatories at Warsaw, Poland; Moscow, U. S. S. R., and Stockholm, Sweden, which were interpreted by Dr. Donald H. Menzel, astrophysicist of Harvard College Observatory.

The Soviet measurements indicate Nova Herculis is still blowing itself apart. Material blown off from the star in its eruption is spreading out with a velocity of 625 miles a second.

From Stockholm observations on the brightness of Nova Herculis show the star went through a period of fluctuating luminosity. Recently the brightness magnitude was 2.5. Three days later its light was weaker, at 3.3 magnitude. And the following day its magnitude was back to 2.8. The weakened intensity was attributed on this occasion to strong absorption of the star's light by cyanogen molecules composed of two atoms each of carbon and nitrogen. As the star regained brightness the absorption of these cyanogen molecules diminished.

The expansion velocities of 625 miles a second reported from the Moscow observatory need to be considered in comparison with observations elsewhere, Dr. Menzel pointed out. "Emission lines of the star bordering the absorption lines showed velocities of approach of the order of only 150 miles a second," Dr. Menzel indicated. Velocities of approach are generally interpreted as the velocity with which the material blown off from the star is approaching the observer in the line of sight.

Professor Otto Struve, director of Yerkes Observatory of the University of Chicago, gave about 110 miles a second for the absorption while Professor Lindblad of Stockholm has reported 190 miles a second. Since absorption and emission lines overlap considerably it is difficult to know where the centers of the lines lie. Therefore the velocities reported depend somewhat on an observer's habits in measuring. The position of the centers of the spectral lines is the vital information from which the displacement can be measured and, hence, the expansion velocity. The relatively slow rise to maximum suggests that the lower velocities are more nearly correct.

EFFECT OF ALTERNATE FREEZING AND THAWING ON TUMOR VIRUS

FROZEN and thawed sixty times, the virus or causative agent of one kind of cancer is still potent enough to produce tumors when injected into chickens according to a report in *The American Journal of Cancer* by Professor H. E. Eggers, of the College of Medicine of Nebraska, and Dr. John K. Miller, of the Nebraska Methodist Episcopal Hospital and Deaconess Home. The work was carried out with the famous Rous chicken tumor. Although it is twenty-three years since Dr. Rous showed that this particular kind of tumor can be ground up and filtered without losing its tumor-producing quality, investigators are still uncertain as to whether the causative agent is a living substance or something in the nature of a chemical enzyme, without life, but capable of inciting changes in the body which result in cancer.

Professor Eggers and Dr. Miller started their experiments in the hope of shedding light on this problem. Because this tumor filtrate could withstand being frozen rapidly with carbon dioxide snow sixty times and sixty times thawed out without losing completely its tumor-

producing property, they believe it is probably not a living agent. It showed a resistance to freezing and thawing greater than other known living agents, such as bacteria or other cellular organisms.

They conclude that these experiments suggest the tumor filtrate's nature is of "an unorganized character," which would mean it contained no living cellular organisms. But they do not feel their work has completely ruled out the possibility that the agent is living, since the filtrate might contain organized bodies so minute as to escape the effect of sudden and repeated changes of volume.

The freezing and thawing were done with practically no oxygen present, a feature which previous similar experiments by other scientists lacked. The presence of oxygen might give the tumor filtrate greater ability to withstand unchanged in potency the freezing and thawing process.

HEART DISEASE RELATED TO ACTIVITY OF THE VAGUS AND ACCELERATOR NERVES

VENTRICULAR fibrillation, a fatal heart condition, and auricular fibrillation, also a grave cardiac disorder, have been found by the researches of Drs. Louis H. Nahum and H. E. Hoff, of the faculty of the Yale School of Medicine, to be caused by the external nerves of the heart. Dr. Nahum reported on his work to the New Haven Medical Association, of which he is the retiring president.

In normal hearts, Dr. Nahum explained, the external nerves, the vagus and accelerator, regulate the beat, but in abnormal hearts, it is these nerves acting with other agents that bring about fatal rhythms.

In cases of benzol or chloroform poisoning, and electric shock, it is the accelerator nerve, together with adrenalin liberated by the adrenal glands, that cause changes from the normal heart beat to the ventricular fibrillation. This fatal heart beat can be prevented by removing the accelerator nerve from the heart and excising the adrenal glands.

The vagus nerve, on the other hand, was found to promote auricular fibrillation. In the presence of an excess of thyroxin, from the thyroid gland, as in certain goiter patients, or in the case of electric shock, the vagus nerve, according to Dr. Nahum, becomes over-active and instead of following its usual rôle of slowing the heart, brings on the irregular auricular fibrillation.

"The general concept of the influence of the extrinsic nerves of the heart is that they regulate its rate: the vagus nerve slowing the heart while the accelerator causes the heart to beat faster, the normal rate being the resultant of these two forces," Dr. Nahum said. "All the experiments, however, have been based upon stimulating either of these nerves in animals with healthy hearts, but there has been no investigation of the grave disorders that they may and do produce. During the course of the investigation at Yale, it has been found that certain chemical substances which when injected reproduce the same effects as are obtained when the nerves are stimulated. Thus acetyl choline can, when injected, produce the effect of vagus nerve stimulation, while epinephrin in the same way produces effects upon the heart which are indistinguishable from the action of the accelerator nerves. With the aid of these chemicals it is possible to study what part the nerves of the heart play in certain cardiac diseases. It was found that the accelerator nerve under certain abnormal conditions may cause sudden death, while the vagus nerve under other conditions may produce a serious disorder of the heart called auricular fibrillation."

ANCIENT MAN IN TEXAS

MAN-MADE weapons buried eighteen feet underground, have been unearthed near Austin, Texas, by Professor J. E. Pearce, anthropologist of the University of Texas, and are hailed as convincing evidence that North America had inhabitants far earlier than archeologists generally concede at present. The first discovery was witnessed by Dr. E. H. Sellards, professor of geology at the university, who has studied the geologic formation of the site and pronounces the discovery "highly significant in the early history of man in this part of the world."

The objects consist of flint dart points and slivers from flint workshops scattered in quantities through various strata of an old Brushy River terrace, near Round Rock, Texas. In some levels of the terrace, burnt-out hearth fires and kitchen refuse of the ancient Texans have also been detected.

The significance of the discovery is that the time scale of America's vague prehistory must be stretched to a greater length, like an elastic band. For if the river terrace flints are as old as the geology proclaims them to be, they are still not so old in type as some other Texas relics of man. Hence, the older relics must be given a new status, as having a much greater antiquity than has heretofore been assigned them. The latest Texas find may, or may not, go back to the Ice Age. According to Professor Sellards, "The find is of the first order of importance in that it clearly demonstrates the fact that man was living here, not sparsely, but in numbers during the time when our broad valleys were being carved and filled by normal stream action."

Referring to scientific doubts and arguments over many reported discoveries of early Americans, Professor Sellards commented: "One beautiful feature of the situation lies in the abundance and unmistakable character of the archeological materials. A few minutes digging at the right place brings to light chips and artifacts to such effects as to settle at once all doubts as to the archeological facts. Formerly it was supposed that man first appeared in North America from 8,000 to 10,000 years ago. The recent discovery at Round Rock by Mr. Pearce and similar discoveries elsewhere are tending to place the time of the appearance of man on this continent from 10,000 to 20,000 years earlier."

HIGH-ALTITUDE FLYING

HIGH-ALTITUDE flying is the only apparent way of reaching the high cruising speeds demanded of present passenger aviation and at the same time obtain economical operation, according to W. Bailey Oswald, of the

Douglas Aircraft Company writing in the *Journal* of the Aeronautical Sciences.

The future promises high-speed flying at altitudes up to 40,000 feet with costs equal to or less than those of present-day low-altitude flights, predicts Mr. Oswald.

In his extensive report showing that high-altitude flights are sound both from the engineering and economy sides, Mr. Oswald indicates that by using the newest type planes with superchargers and variable pitch propellers it is possible to obtain a 69 per cent. increase in cruising speed with an increase of only 6 per cent. in operating costs. This high ratio of speed gain to operating cost increase is possible for planes cruising at 40,000 feet.

Superchargers, compressing the rarefied air of stratospheric heights to densities usable by motors and passengers alike, is the key to high-altitude flying, reports Mr. Oswald. The capacity of present superchargers need only be increased some 15 per cent. to make possible flights at 40,000 feet. Such equipment will serve adequately the engines and at the same time will give a sufficient supply of air to passengers and pilots. In fact, he indicated, once the problem of supercharging a motor at 40,000 feet is solved the problem of passenger oxygen supply will be solved also.

Even the heating of the air from its average temperature of 55 degrees below zero will be taken care of, for the compressing of the atmosphere automatically warms it up to temperatures as high as 300 degrees.

When airlines use a high-altitude, ten-hour flying schedule from New York City to Los Angeles, the cost per passenger may be as low as $100. A fare of $125 to the passenger would make such a problem economically sound, he says.

Discussing high-altitude flying from the passenger's viewpoint, Mr. Oswald said, "In high-altitude flying some passengers might find the darkened sky and reduced visibility of the earth objectionable; but high-altitude flying must be regarded purely as a means of transportation. Sightseeing will have to be done at low altitude with all the attendant evils."

High flying makes for safer flying, Mr. Oswald reports, for from an altitude of 40,000 feet an airplane can glide 120 miles and take an hour to do it. It might even be possible, in many cases, for mechanics on the plane to make the necessary repairs during this hour of descent.

Flights at high altitudes are economically feasible for distances greater than 600 miles, the aviation authority reports. For shorter trips the plane would spend all its time gaining altitude and then descending. The result would only be about the same as a level flight at half the maximum altitude.

ITEMS

DUST storms, choking the air and blinding the sun, may come whirling out of the Northwest at any time, the U. S. Weather Bureau warns. The soil throughout the drier western part of the Great Plains region, from eastern Montana and the western Dakotas down to eastern Colorado and western Nebraska, is still in a state of unrelieved drought, and bare of any snow cover. A high wind, which is normally to be expected during late winter, will almost inevitably mean a dust storm.

LITTLE cradles that became coffins thirty million years ago have had the riddle of their tragedy read by Dr. Roland W. Brown, paleontologist of the U. S. Geological Survey. They had been unexplained ever since they were found four years ago by Dr. Charles W. Gilmore in Wyoming rock deposits of Eocene Age. They are small cylindrical white objects, some of them of solid limy substance, some of lime mixed with clay. First guesses made them anything from fossilized snake eggs to date seeds. But by tracing them down a number of geological and biological clues, Dr. Brown has reached the conclusion that they are the larval cases of ancient burrowing bees, in which infant insects were wrapped for the sleep that would transform them into full-grown winged forms.

A NEW source of radium has been discovered. Plans are now under way for the construction of a radium extraction plant on the island of Tcheleken in the Caspian Sea. Tests by the Institute for Rare Metals in Moscow show that water from wells on this isolated island contains up to a half milligram of radium for every 1,000 cubic meters of water. At current American prices of $60,000 for a gram of radium some thirty dollars worth of the valuable radioactive element could be obtained from the volume of water in a tank twenty feet in diameter and ten feet wide. Pumping and extraction plants will be built on the island in 1935.

A STUDY of a combination of silver and electricity to preserve fruit juices such as cider and grape juice is being made by Lawrence H. James and E. A. Beavens, of the U. S. Bureau of Chemistry and Soils, and was reported to members of the Society of American Bacteriologists. The method is similar to the sterilization of water in swimming pools by the use of colloidal silver. A small electric current is passed through the solution, which forces the silver into the juice so that when enough silver is present, it delays fermentation of the fruit juices.

REAL sea serpents once swam in the offshore waters near the present site of the national capital. They were, apparently, at least as large as the biggest living land snakes. But they never scared anybody, or got stories about themselves in the papers, because they lived sixty million years ago, long before the first human beings appeared anywhere on earth. Evidence for the existence of these ancient sea monsters has been turned over to the Smithsonian Institution, in the shape of a single fossil vertebra, or backbone joint, picked up on Belvedere Beach, Va., by Dr. W. Gardner Lynn, of the Johns Hopkins University. By comparing this one bone with those of living serpents Dr. C. W. Gilmore, of the U. S. National Museum has been able to make an estimate of the size of the extinct sea serpent. He judges it to have been perhaps about twenty-five feet long, and thick in proportion. That is about as big as a really large modern python, of which this Virginia sea serpent may have been a remote cousin, though not an ancestor. Dr. Gilmore has named the monster *Paleophis virginianus*, which is Greco-Latin for "ancient Virginian serpent." It had some contemporaries almost as large as itself, two of which have been found in New Jersey and one in Alabama. They were all sea dwellers.