SCIENCE NEWS

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METEOR CRATER

THREE hundred thousand tons of meteors, in a close swarm, exploding as they hit the earth and producing effects as violent as 400 million tons of T.N.T. could have produced the famous meteor crater, nearly a mile in diameter, near Winslow, Arizona.

At the recent meeting of the American Astronomical Society in Chicago, Dr. Forest Ray Moulton, formerly professor at the University of Chicago and now a public utilities official, told of his conclusions, which leave little hope that there may be any of the original meteors left.

It has been thought that a much larger meteoric mass, perhaps ten million tons or more, would have been required to produce the effect, and that this great mass, possibly containing many rare elements, was near the crater, just below the surface, where it could be mined. Large sums of money have been spent in efforts to locate the mass, but so far they have not been successful.

Dr. Moulton, who is one of the country's leading astronomers, presented the following argument. A small meteor, perhaps weighing a pound or so, would enter the earth's atmosphere at its initial speed of around ten miles a second. At first it would be retarded very little, but as the atmospheric resistance increased to the point where it was greater than the gravitational attraction, then the meteor would slow up. Most of the energy is radiated away as light and heat, and the meteor burns up. But a meteor of larger mass, say a thousand tons, encounters very little resistance as it passes through the atmosphere, and when it hits the earth, it encounters a very high resistance. For a thousand-ton meteor hitting rock, Dr. Moulton calculates that the resistance is 50,000 tons per square inch and that it does work at the rate of 2,400,000 horsepower for each square inch. Even nickel iron is scarcely more resistant to these enormous forces than tissue paper, and so the meteor would be completely broken up and destroyed with explosive violence.

He also called into question the theory that many meteors come into our solar system from outer space. This has been suggested because some of the meteors have been thought to move at speeds which would carry them in the curve called a hyperbola. Meteors originating in the solar system would move in a parabola and it has been thought that many might come from the region of other stars where they might have originated in the same way that the home-made product was made. Dr. Moulton, however, expressed doubt that meteors, except in very rare cases, are moving along hyperbolas, and that therefore most of the shooting stars we see in the night sky, and the occasional meteorites that land on the earth, are members of the solar system, like the sun and earth.

POSSIBLE EFFECTS OF RADIATION FROM THE SUN

A HITHERTO unsuspected kind of radiation from the sun to the earth that is far more penetrating than X-rays and that approaches the cosmic rays studied by Dr. R. A. Millikan in penetrative power, is the cause of volcanic activity and earthquakes on the earth, and even of weather.

At the meeting of the American Astronomical Society, held recently in Chicago, Dr. Benjamin Boss, director of the Dudley Observatory, Albany, New York, presented this startling and sensational hypothesis to his co-workers. However, he declared that it does not do violence to generally accepted theories of to-day, but fits in with them. It provides a mechanism by which effects already known to be related may interact.

Dr. Boss believes that this radiation travels along the lines of the magnetic field of the earth. On this account it comes in near the magnetic poles of the earth, thus reaching all parts of the earth at all times. In this way he avoids any objection to his theory on the ground that the radiation should be greater as the earth faces the sun, and should be evident by its electrical effects, changing regularly every day. He believes that it is this constant flow of radiation that maintains the electrical field of the earth. The rays strike the earth and produce within the well-known "earth currents," he thinks, causing excitation of the atoms there. But as the intensity of the radiation varies, the excitement of the atoms changes, and they in turn expand or contract, thus causing great terrestrial effects such as earthquakes and volcanic eruptions.

Even the building of continents and mountain ranges, he suggested, have been caused in a similar way, as the radiation from the sun may have varied far more widely in the past, and may do so again. This was caused, according to the theory, as the sun passed through regions in space in which there was a difference of electrical potential, associated with inter-stellar matter or clouds of cosmic dust.

Similar radiation, Dr. Boss says, is emitted from all the stars, and it travels along the lines of magnetic force of the entire galaxy or milky way system. The nebulae in our system, he believes, are made of similar dark matter which is illuminated by stars passing through them, excited in a similar way. He said that the stars in these bright nebulae are in an intense electrical field, and that, as their atoms are excited, the star tends to become one of the class known as type O or B, which are blue in color and very massive.

The magnetic field of the milky way system, or galaxy, it is suggested, is caused as the charged atoms revolve around, for our galaxy is known to be rotating around a point in the constellation of Sagittarius. The fact that the dark regions of the milky way are centered in this constellation is seen by Dr. Boss as agreeing with his theory.

He also makes the suggestion that there may be a shift in the wave-length of light as it passes through a magnetic field, and that this may cause the lines in the spectra of distant spiral nebulae or "island universes"

to be displayed to the red, an effect that has been well observed in recent years.

This agrees with Einstein's theory of a curved universe, so Dr. Boss says that his ideas make the Einsteinian universe an electrical one. Similarly another proof of the Einstein theory, the shift of spectral lines in sunlight to the red, might thus be due to the effect of the sun's magnetic field.

SOIL EROSION

A REMEDY for the sinister scourge of soil erosion, which in this country has already destroyed enough land to support a nation, was described by H. H. Bennett, of the Bureau of Chemistry and Soils, of the U. S. Department of Agriculture, at the First Inter-American Conference on Agriculture, Forestry and Animal Industry meeting in Washington. Representatives of all of the twenty-one American republics are attending the conference.

"Not less than 126,000,000 pounds of plant food are being washed out of the fields of America every year," Mr. Bennett said. "Something like 17,500,000 acres of land that were formerly cultivated in this country have been destroyed by gullying or so severely washed that farmers can not afford to attempt their cultivation or reclamation. This is enough land to support a nation. It exceeds the total area of arable land in Japan.

An even vaster area of land has been injured by sheet erosion. This is a slower process of erosion, as distinguished from gullying, which removes a film of soil from entire fields whenever it rains enough for water to run downhill. Erosion operates chiefly on topsoil, the most productive part of the land. This is the humus layer, that vital part of the soil from which plants get their principal nourishment. When it is washed off, clay subsoil is generally exposed.

Mr. Bennett described some of the areas in various parts of the country where as much as forty inches of soil have been lost through erosion since the land has been under cultivation. In some places the land has been washed away to the underlying rocks.

Removal of trees from the slopes, destruction of prairie grasses by tillage, and disturbance of ground stability by plowing, overgrazing, excessive burning, freezing and thawing have resulted in this intensified soil impoverishment.

Cropping schemes, construction of terraces, soil-saving dams and vegetative obstructions are some of the means of reducing the evils of soil erosion. These have been tried in different sections of the country, particularly the South and West, and good results are already being reported.

We are not yet on the verge of a land shortage, but we are getting closer every year to a shortage of good land. Much of the losses already revealed by an expert survey can be reduced but the problem must be vigorously attacked at once. A tremendous amount of awakening among farmers, landowners, bankers, merchants and others to the seriousness of the problem is necessary, as well as a vast amount of research and demonstration work.

In regions where some of the land-saving measures are already being tried, it has been found that both the quantity and quality of the crop has improved. In the cotton crop, for instance, it was found that uneroded land, that is land which had not lost its topsoil, produced more lint cotton per acre, more seed, and the seed itself yielded more oil. Since cottonseed may be bought on the basis of oil content in the near future, this last is considered an important discovery.

DUST EXPLOSIONS

THE fifth and most severe of five dust explosions that have occurred in a month is now being investigated by the U. S. Department of Agriculture. David J. Price, engineer in charge of grain dust explosion work in the Bureau of Chemistry, has been sent to Decatur, Illinois, to study at first hand the disastrous explosion which occurred there on September 20, in a starch plant.

Just before departing, Mr. Price told *Science Service* that the plant in which the explosion occurred was a very modern one, and was considered to be one of the most progressive in the practice of methods for the prevention of explosions. Yet an explosion occurred, with five deaths resulting and two more injuries that are expected to be fatal. Because the explosion occurred despite all precautions, Mr. Price thinks that study of effects may reveal some hitherto unknown facts.

The first of the recent series of dust explosions occurred on August 20, in Baltimore, when a grain elevator was demolished with five deaths. This, also, was a very modern plant, in which all recommended precautions were taken. The next two were cattle-feed plants in Kansas City and Minnesota with three and two deaths each. Then occurred one in a tobacco plant in Richmond, which, fortunately, resulted in no loss of life. Mr. Price stated that this was one of the first explosions of tobacco dust, which is not ordinarily as hazardous as dust of other kinds, such as grain.

Dust becomes explosive when floating in the air, so that each particle has a plentiful supply of oxygen to enable it to burn rapidly. The same dust, if in a pile, might not burn, and might even extinguish a match plunged into it.

THE DIAGNOSIS OF CANCER

HIGH accuracy in diagnosing cancer from X-ray pictures was demonstrated by the group of 292 radiologists gathered at Baltimore for postgraduate study of the disease. Out of 200 voting on one case, 197 were correct in their diagnosis; in another, only one in 157 made a wrong diagnosis.

The scientists came at the invitation of Dr. Joseph Colt Bloodgood, of the Johns Hopkins University, who is sponsoring a series of postgraduate demonstrations to be given four times a year in connection with the Surgical Pathological Laboratory of the Johns Hopkins University. This session was devoted to bone cancer and other diseases of the bone.

"You should be well satisfied with yourselves," Dr. Bloodgood told the doctors after they had given their diagnoses on a number of cases. X-ray pictures were

shown of the diseased bone and lantern slides of microscopic sections of the tissues. The history of the case was briefly told them. Then they handed in their diagnoses and recommendations for treatment. Finally, they were told the diagnosis made of each case at the Johns Hopkins Laboratory, the treatment instituted, and the final result.

These demonstrations have inaugurated a new method of teaching, the mass intensive method, according to Dr. John M. T. Finney, clinical professor of surgery at the Johns Hopkins University.

"You will see here specimens such as you wouldn't see in a lifetime of practice," Dr. Finney said.

The last ten years show an increase of nearly 30 per cent. in the number of patients who are living five years or more after treatment for cancer of the bone, Dr. Bloodgood said at the beginning of the session. The cures have been accomplished by amputation, by cutting out part of the bone involved, and by irradiation with radium or X-ray.

The reason for the tremendous improvement in the cures is that people are learning to insist on immediate X-ray examination when there is any pain or swelling in the region of a bone or joint, regardless of whether there has been an injury or not.

Since the public has learned to come earlier for examination, the doctors must learn to distinguish cancer from other diseases in earlier stages than before. Correct diagnosis in this type of case often means the saving of a limb. The postgraduate demonstrations are planned to help the doctor to keep up with his patients and enable him to diagnose their diseases correctly no matter how early they come for examination. In this lies a hope of controlling cancer.

ITEMS

A TREACHEROUS little stream that flowed down a cliff-side and threatened to destroy the prehistoric ruins of Chetro Ketl in Chaco Canyon, New Mexico, has been foiled by a dam which forces the stream to take another course. Rescuing of the valuable pueblo ruins was done by two Navajos, by the direction of the University of New Mexico and the School of American Research, which conducted new researches at the site this summer. The stream has been undermining the pueblo for years and has caused serious curvature in some of the walls. The latest excavations at Chetro Ketl show that the pueblo was a story taller than has been supposed, and that it stood five stories tall in its prime. This discovery gives Chetro Ketl the distinction of being the largest pueblo in the canyon, even larger than the Pueblo Bonito which also was a five-story settlement.

THE prediction by Dr. Sven Hedin, Swedish explorer of Central Asia, that in 25 years the River Tarim in Chinese Turkestan would abandon its course and return to an ancient channel farther north has now been fulfilled, according to a communication received at Washington. The river is running now where it did 1,600 years ago. Dr. Hedin's attention was called to the wandering stream when he tried to follow a Chinese map 1,600 years old. It appeared that the Chinese geographers had made a mistake, for the river on the map was not on the landscape, but instead there was a "new" river to cross 550 miles away. After studying geological conditions, Dr. Hedin justified the Chinese scholars and their map by explaining that the southern branch of the Tarim apparently swings back and forth like a pendulum. He predicted then that the accumulating silt would soon drive the river to seek its old course.

BOILING mercury will take the place of electric mot and pumps in home refrigerators if a new method j announced comes into general use. The new process the invention of Dr. Daniel F. Comstock, president Comstock and West, and Lyman F. Whitney, of firm's technical staff. Dr. Comstock was a form member of the faculty of Massachusetts Institute Technology and was one of the inventors of the tech color process of motion pictures in color. The machi is called a stator, because all moving machinery has be eliminated. Instead a small boiler contains mercur and when it is heated and the mercury boils, the vapo is discharged into a venturi tube, sucking water vapo from the cooling unit and compressing it. Under the reduced pressure the remaining water rapidly evaporates with resultant cooling. The heavy mercury flows back into the boiler and as it does so it pumps the wate from the condensed water vapor back to its original height.

HOME-MADE talking movies, made at a cost of $12 as compared with a figure many times as much for the professional article, are being employed at the Medical College of Virginia, Richmond, Dr. Sidney S. Negus, professor of chemistry there, told members of the American Chemical Society meeting at Cincinnati in September. A 16 mm home motion picture camera is used, he said, to photograph the instructor writing chemical formulae on the blackboard. Then the pictures are subsequently run, and as they are run he talks into a microphone connected with a simple recording apparatus that makes a record on an aluminum disc. When the movies are shown to the students and at the same time the record is played on a phonograph, an effect of partial synchronization is obtained.

THE reported discovery of "ruins of a large stone city containing hundreds of buildings," about 100 miles from San Diego, has been investigated by Spencer L. Rogers, curator of anthropology of the San Diego Museum, who reported to *Science Service* that the stone "city" was built by nature and not by prehistoric Indians. The site with its irregular stone formations was once chosen by Indians as a convenient ready-made place for a habitation. This is shown by presence of numerous mortar holes in rocks and a wide distribution of potsherds over the surface. The site was discovered by Charles A. Davis, of San Diego.