

SCIENCE NEWS

Science Service, Washington, D. C.

VARIATIONS IN THE EARTH'S MAGNETISM

FROM near the magnetic North Pole, daily radioed news of the variations in the earth's magnetism as observed by a little band of ice-locked explorers, the MacGregor Arctic Expedition, are picked up each day by radio-amateurs who cooperate as a hobby. They are relayed to the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, where experts decode them and compare them with similar observations elsewhere. Science Service makes this news from the Arctic available to investigators at observatories and institutions throughout the world by including them in "cosmic data" messages distributed by both radio and mail.

Wintering far within the Arctic Circle, beyond even "the land of little sticks," in the icy reaches, the MacGregor expedition members, using Carnegie Institution instruments, make continuous observations of the changes in earth magnetism, and are probing the secrets of the aurora or northern lights. So sensitive are the instruments used by the expedition that they must be kept in special cabins. One is built of brass and insulating board, with no iron parts; another is insulated with a four-inch layer of balsam wool to keep the temperature constant. These cabins, supplied by the Carnegie Institution, together with the instruments, were shipped unassembled to the Arctic, and erected there.

Northern lights are studied hourly, and the heights of the displays are determined by taking simultaneous photographs from two cabins fifteen miles apart. Special short-wave radio equipment is used in signalling between the cabins. From these studies, it is hoped to determine more accurately the relations of magnetic phenomena, northern lights and sun-spots. The radio messages from the Arctic are picked up by members of the American Radio Relay League, the amateur radio organization. The "hams" spend long hours at their sets providing the necessary communication between the observers in the Arctic and the scientists in Washington.

ELEMENT 87

THE discovery of element number 87—the last but one of the missing elements in the periodic table—has been made in France. The finding of this elusive element, whose discovery has been previously reported and afterward disproved, was made by Horia Hulubei, in France.

The discovery has not yet been reported in scientific journals but was discussed by Dr. F. R. Hirsh, Jr., research fellow at the California Institute of Technology, speaking at a seminar of the physics department. Dr. Hirsh reported that Hulubei's discovery was made as a result of a suggestion of Dr. Jesse W. M. DuMond, research associate at the institute. In 1930 Dr. DuMond first suggested an apparatus, known as the curved crystal focussing spectrograph, which was modified by M. Cauchois and used by Hulubei in the discovery of element number 87.

While at Cornell University Dr. Hirsh, one of the 17

or 18 investigators who sought the formerly missing element, reported to the American Physical Society that he was unable to confirm a prior claim by Professor Jacob Papish and Eugene Wainer, for the discovery of the element. Dr. Hirsh predicted that the last missing element, number 85 in the periodic table, might be discovered by the powerful instrument used in France. This instrument is so sensitive that it can detect one part of a given element in 10,000,000,000 parts of polluciate or any chemical or mineral. Polluciate is the mineral in which Hulubei discovered element number 87, and which he has named madavium. The only remaining missing element is ekaiodine.

TREE RINGS AND THE MAYAN CALENDAR

TREE rings of the Southwest are now expected to solve the puzzle of the Mayan calendar, enabling archeologists at last to date the ancient civilization that flourished in the American tropics before Columbus.

New discoveries in Mayan ruins in Guatemala, which bring the solution definitely nearer, have been announced by Dr. A. V. Kidder, of the Carnegie Institution of Washington. Dr. Kidder, who led the latest expedition of the institution to Guatemala, told of finding pottery there, which was clearly brought down to the Mayan cities by Toltec Indian traders from their own great city of Teotihuacan, far to the north near Mexico City.

Translating Mayan inscriptions at the Guatemalan ruins, Dr. Kidder finds that these Mayas and the Toltecs who traded with them were living either about 700 A. D. or 950 A. D., but archeologists are unable to agree which century is correct. It is the two conflicting ways of translating Mayan dates into our modern calendar, one shifting Mayan history about 250 years later than the other, that Dr. Kidder now sees hope of straightening out.

Archeologists must now seek the missing link to settle the Mayan civilization in historic centuries. And that link is pottery or some other trade object linking these Toltecs with the southwestern United States, where pueblos built by Indians are precisely dated in centuries, and even exact years, by means of the tree ring calendar.—EMILY C. DAVIS.

DINOSAURS

C. W. GILMORE, curator of vertebrate paleontology at the U. S. National Museum, pointed out in the course of an illustrated lecture in Washington that duckbill dinosaurs possessed two thousand teeth, ranged in rows both horizontal and vertical. Duckbill dinosaurs fed entirely on plants. Much more formidable were the fewer teeth in the jaws of the tyrannosaurs: their six-inch spikes were shaped like barracuda teeth and were ten times bigger. The duckbills not only had these batteries of many hundreds of teeth ready for immediate action at all times, but if a tooth were worn out or broken, it was immediately replaced. Back of all the teeth were tooth buds ready to grow new ones.

A much bigger dinosaur, also a plant-eater, yet with fewer and weaker teeth, was *Diplodocus*, of which the National Museum has a fine skeleton. His teeth were all in the front end of his jaws, and they were slender and rake-like. He had no real chewing teeth at all. It is therefore conjectured that *Diplodocus* raked up soft vegetation from the swamps and shallow lakes where he wallowed and gulped the mess down whole, to be ground up in his gizzard by the bushel or so of stones he habitually kept inside for that purpose.

Not all the vegetarian dinosaurs were creatures of mild and inoffensive habits. The ceratopsians, which had formidable horns projecting forward from their heads, and wide, bony frills to protect their necks, must have been the wild bulls of the Age of Reptiles. Mr. Gilmore told of numerous finds of horned dinosaur skeletons which show broken ribs, punctured frills, and horns snapped off, all with evidence of healing afterwards, which indicated that these injuries had been received in the course of truculently active lives.

TESTS OF THE ACCELERATION OF GRAVITY

DELICATE tests of the acceleration of gravity in the world's tallest structure, the Empire State Building in New York City, have been completed. The tests will mean more gasoline and oil for America's motor cars. On the findings of investigators of the U. S. Coast and Geodetic Survey rests the calibration of instruments used in detecting geological oil structures, like salt domes, deep within the earth.

Speaking before the Philosophical Society of Washington, Lieutenant A. J. Hoskinson described the tests and their significance. Oil companies use portable instruments known as gravimeters to locate differences in the gravitational attraction of buried geological formations. On the findings of these portable instruments, plus other geological information, is based the decision to drill or not to drill for petroleum.

Whether the gravimeters give proper readings of the vertical component of the earth's gravitational acceleration can best be tested by taking accurate observations with pendulum devices over as great a vertical range in altitude as possible. Such pendulum observations, if made by climbing mountains, are erratic because of the varying rock mass of the mountain. Hence, came the decision to make the tests in the 1,200 foot altitude range of the Empire State Building. Ordinary pendulum gravity apparatus would be useless in such tests, said Lieutenant Hoskinson in an interview, because of building vibration. However, the Coast and Geodetic Survey had available the very special type of equipment, using three pendulums, which had been successfully employed in submarine gravity measurements at sea. This device, developed by Dr. F. A. Vening Meinesz, of Holland, gives accurate observations even when the roll of the submarine is as great as 5 degrees. In the Empire State measurements the building vibrations and sway were very much less than this amount.

According to theoretical equations the acceleration of gravity should grow less as one goes to greater altitudes,

Whether the theoretical equation gave true results for great vertical heights had never before been checked with pendulum apparatus. By establishing twenty observations stations differing in total altitude by 1,200 feet, data were obtained which gave an experimental check on the correctness of the equations on which depends the calibration of the gravimeter instruments used in oil prospecting.

The difference in gravitational acceleration from the bottom to the top of the Empire State Building was shown to be a variation of one part in 9,000. Thus a man weighing 150 pounds at street level would weigh one quarter of an ounce less in the observation tower. This weight difference would show up on a spring scale but not on a beam type of scale. A repetition of the tests in some region such as Texas in a high building over a low density mass like a salt dome should now be made. Lieutenant Hoskinson was assisted in his observations by Lieutenant C. I. Aslakson, of the U. S. Coast and Geodetic Survey, and Dr. Maurice Ewing, assistant professor of physics at Lehigh University.

A NEW METHOD OF REBUILDING ROADS

A NEW "shake-down" method of road construction which is intended to permit building new roads from old, broken down highways at a fraction of present highway costs, is described in a patent granted to William P. Day, of Cleveland Heights, Ohio.

Vibrations applied at the rate of 2,000 to 4,000 per minute literally shake the new road down into place, doing away with the old steam roller, after the old one has been broken up. Literally everything in the old road-bed is used in rebuilding the road, according to the newly invented method. Except for some grout, a fluid mixture of sand, cement and water, no new road building material is needed.

First, compressed air drills and chisels break up the worn out road. But the chunks of concrete are not hauled away. Instead they are separated into large and small pieces. The workers then spread a layer of the large pieces on the cleaned road bed. On top of this is placed a layer of the smaller pieces.

The vibrating machine is then used to apply rapid, violent vibrations to the road. The 2,000 to 4,000 vibrations per minute cause the smaller pieces to settle and partially fill and wedge into the voids between the larger chunks of concrete. After this vibration compacting treatment, a layer of grout is spread and the road is vibrated for a second time. This shakes the grout into the remaining spaces to form a bond between the large and small chunks of old concrete.

Traffic, according to Mr. Day, may be sent over the road almost immediately. The tightness with which the vibrations have compacted the pieces of concrete and the practical absence of spaces between them permits this rapid use. Need for steel reinforcing screens and expansion joints is eliminated. The rebuilt road, it is claimed, is at least as strong, if not stronger, than the original highway. The new method can be used for repairing or rebuilding roads made of concrete, macadam, brick, stone and similar materials. Savings of 50 to 75

per cent. over the cost of a new concrete highway are claimed.

ELIXIR OF SULFANILAMIDE-MASSENGILL

THE needless deaths of 73 persons who took Elixir of Sulfanilamide-Massengill constitute a catastrophe that continues to bring repercussions. The additional twelve deaths reported by the American Medical Association this week are not recent but have only recently been reported as having followed the administration of the toxic elixir.

The *Journal* of the American Medical Association in the current issue reports that many physicians, the public and several businesses have been thrown into confusion over the nationwide publicity given this major tragedy. Some people have blamed the deaths on the sulfanilamide, which was not the causative factor. It was the diethylene glycol, used in the solvent, that was the harmful agent.

Now it appears that various businesses that properly enough use either diethylene glycol or sulfanilamide are being attacked by misinformed editorial writers or malicious whispering campaigns set afoot by unprincipled competitors who do not hesitate to profit from unanticipated misfortune. In an effort to clear up the confusion that has resulted the *Journal* of the American Medical Association publishes two charts pointing out the proper nomenclature and giving the chemical structure of the products.

Most of the confusion concerns the various sulfanilamide derivatives, their properties and names and the chemical difference between ethylene glycol (used in solution as a solvent and an ingredient for antifreeze solutions), diethylene glycol, also a solvent, and dioxane. "The deaths resulted from overdosage of a toxic agent wrongly used," points out the *Journal* in an editorial. "Such an incident bears no relationship to the proper uses of either of the substances concerned." The editorial makes plain that nothing in the present Food and Drugs Act or in any of the food and drugs bills now before Congress will prevent a repetition of this tragedy. Complete disclosure of formulas on the label might be helpful.

ITEMS

A NEW star or nova in Sagittarius that in May, 1936, rose to 10.8 magnitude after much fainter obscurity has been found on Harvard Observatory photographic plates by Mrs. Margaret Mayall.

GAMMA CASSIOPEIAE, one of the prominent but variable stars, has decreased in brightness in recent months. Dr. C. M. Huffer, of Washburn Observatory, has advised the Harvard College Observatory that this star has changed from magnitude 1.75 on May 7 to 2.46 at the beginning of this month. Members of the American Association of Variable Star Observers confirmed this stellar change and found that the most pronounced change occurred in October.

A HOT spring in Yellowstone's Norris Geyser Basin, immediately east of the Cliff Geyser, has suddenly shot up

into a geyser. In place of the comparatively flat, bubbling water common to hot pools, the former pool has been showing some spectacular activity with a large volume of water shooting upward to heights varying from 10 to 50 feet. The near-by Cliff Geyser has also shown intense activity during recent weeks.

FOLLOWING the lead of American investigators now smashing atoms with cyclotrons in transmutation experiments, Soviet workers at the State Radium Institute in Leningrad have just completed the construction of a similar device. In a report to the *Physical Review*, V. N. Rukavichnikov, of the U.S.S.R. State Radium Institute, describes the Russian cyclotron. Atomic particle "bullets," consisting of protons, can attain energies of 2,100,000 electron-volts in the equipment. With this energy elements can be disintegrated and changed into new forms. Over two score American universities have comparable equipment and the original and premier equipment in the laboratory of Professor E. O. Lawrence at the University of California can produce particles having peak energies of over 5,000,000 electron-volts.

PRICES of chemicals have remained at nearly the same level they occupied just before the beginning of the twentieth century while all other products have risen more than two thirds in cost, Lamont du Pont, president of E. I. du Pont de Nemours and Company, said, when speaking at the dedication of a chemical exhibit at the Franklin Institute. Mr. du Pont asserted that hourly wages are 15 per cent. higher than those paid in other manufacturing fields. The average chemical worker, he stated, earns \$31 a week as against \$26 a week for other industries. Employment in the chemical industry is 27 per cent. above the peak 1929 levels, despite the fact that industry as a whole is still slightly below the pre-depression level. Dr. C. M. A. Stine, du Pont vice-president, described recent contributions of chemistry to every-day life in a talk following Mr. du Pont.

WARMING climate after the recession of the most recent glacial ice, a cooler period, and a more recent warming are shown by evidence collected by Drs. Harry V. Truman and Henry P. Hansen, students of ancient pollens, who have independently studied pollens found in the bogs of Wisconsin. Dr. Truman, ecologist at Beloit College, finds that during an early period in the existence of bogs in his area grasses and pine trees gave evidence of a cool dry period, probably immediately following the ice retreat. Later, a warmer period caused the displacement of trees by grasses, and still later, a cooler climate made conditions favorable for maple trees. Dr. Hansen, of the University of Wyoming, studying other bogs, finds evidence suggesting that boreal plant types declined shortly after the ice melted away, then a few of them returned after a period of many years. The findings of these two workers agree quite closely with those of other workers, who, using entirely different methods of approach, have also found evidence of similar postglacial climatic changes.