SCIENCE NEWS

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RIVER POLLUTION BY MINE SEEPAGE

IT was estimated at the opening sessions of the American Institute of Mining and Metallurgical Engineers, held in New York on February 15, that each day the coal mines on the Ohio River's headwater pour some 20,000,000 pounds of concentrated sulphuric acid into the Ohio River. The engineers are seeking some way to prevent this great menace to down-stream cities' water supply, navigation and public health. Abandoned coal mines—the greatest potential source of the corrosive acid—affect stream pollution on a major scale. They contain much iron sulphide, or pyrite, which the layman knows best as fool's gold. The oxygen in the atmosphere combines with this mineral. Several chemical steps take place, but the final reaction production is the important one. Iron oxide, or rust, and sulphuric acid are produced. The acid seeps off in the drainage water from the mine and enters streams which ultimately form the Ohio. The Monongahela River, for example, is distinctly acid in its character because of such mine acid seepage. Only when it meets the alkaline Allegheny River at Pittsburgh is the situation improved by the partial neutralization of the acid.

E. D. Tisdale, director of the division of sanitary engineering of the West Virginia State Health Department, described how that state, through relief projects, has been employing miners to seal abandoned mines that are believed to contribute more than 50 per cent. to the pollution of the Ohio River. The idea behind such sealing is to cut off the free supply of oxygen and decrease the sulphuric acid production. Discussing the health problem raised by mine acid contamination of streams, Mr. Tisdale said: "In public health significance we observe two distinct rôles played by the acid water. It causes an acid condition in the Monongahela River for the summer and fall periods and during this time of low flows in the Ohio Basin the acid zone appears to creep farther down the Ohio with each drought spell. This makes difficult the operation of water purification plants, and when rains come, changing the river water from acid to alkaline and washing the accumulated sewage sludge in the river quickly down stream, heavy pollution loads come suddenly upon down-stream public water supplies in West Virginia and Ohio, running up the *B. coli* pollution index to a dangerously high figure. Thus the city water supplies down-stream are detrimentally affected."

Navigation suffers greatly from the acid water and especially is this true on the Monongahela, which has the highest concentration of river-borne traffic of any river in the nation. Docks, dams, locks and even vessels themselves suffer excessive deterioration. U. S. Army engineers estimate that the annual cost of navigation from this cause is greater than the entire amount so far spent in sealing abandoned mines to prevent the hazard.

STORMS ON THE SUN'S SURFACE AT TIMES OF TOTAL ECLIPSE

DR. S. A. MITCHELL, director of the Leander McCormick Observatory of the University of Virginia, reported in a lecture, given under the auspices of the Smithsonian Institution, that great storms sweep the sun's surface at the time of a total eclipse. Evidences of extreme solar activity have been obtained from photographs made during recent total eclipses, especially as shown by the coronal streamers and the lower but more intense flaming outbursts known as prominences. A comparison of all these photographs shows that the great activity of the sun was found not only at time of the eclipse but persisted throughout the whole period of four days covered by the plates. Despite the study that had been lavished on the corona, there is considerable doubt as to the real nature of the great extension of pearly light around the sun visible only during a total eclipse. That its great domes and streamers are in some way linked with the flaming prominences of the sun's body itself was suggested long ago, but the nature of the connection is still obscure. Photographs taken during one recent eclipse demonstrate the fact that the longest coronal streamers, on which the shape of the corona more or less depends, are always located near prominences but are not necessarily exactly connected with the prominences which at the time of the eclipse are of the greatest height.

If there were now living any one astronomer old enough to have started his work in 1842, when really scientific eclipse observations began, and if he had "taken in" all total eclipses since that date, with the average amount of bad luck with the weather, he would in that near-century have had only one hour's total observation-time of the totally eclipsed sun. Typical of the sun's unsolved mysteries on which data obtained with total eclipse observations provide only the merest hint, is the nature of the dark lines which appear in the spectrum of the light from the outer corona. Whether such observed dark lines really are coronal in origin or whether they are produced by the scattering of sunlight in the earth's atmosphere is still uncertain. Probably they originate in the corona, but the present evidence is not wholly conclusive.

DISCOVERY IN SOUTHERN GERMANY OF A NEW TYPE OF STONE AGE SKULL

A SKULL of an entirely new type of ancient human being, older than Neanderthal man, resembling him in some respects yet more "modern" in others, has been discovered in a gravel pit at Steinheim, near Stuttgart. It has been subjected to critical scientific examination by Dr. Fritz Berckhemer, of the Württemberger Museum of Natural History. The skull was very little broken, and lacks only the lower jaw and a few fragments of the facial bones. It resembles the Neanderthal type especially in the characteristic pronounced eyebrow ridges,

the wide nasal opening, the massive upper jaw, and the rather low cranial arch. It is markedly different in being shorter, relatively wider, and much more rounded off at the back, and in having considerably less back-slope to face and forehead. In these respects it is more like modern man, *Homo sapiens.*

The antiquity of the Steinheim skull is unquestionable. In the gravel pit with it, and extending up to a level about four feet above the location of the skull itself, were bones, teeth and tusks of an ancient species of elephant, that disappeared from Europe before the end of the Pleistocene Ice Age. From geological evidence available, Dr. Berckhemer has concluded that the new skull is two or three hundred thousand years younger than the famous Heidelberg jaw, but somewhat older than typical Neanderthal man. He does not regard Steinheimer man as directly ancestral to Neanderthal man, but thinks that the resemblances between them can be explained better by regarding them both as descendants from a still unknown common ancestral stock.

INCREASED SAFETY FOR AVIATION

INCREASED safety for aviation is seen in the newest development of the National Bureau of Standards. It is a device which enables any observer on the ground to learn the height of clouds, their thickness and the altitude to which an airplane must climb to come out above them. H. Diamond, W. S. Hinman, Jr., and F. W. Dunmore, of the Bureau's Radio Division, have cooperated in the development of the instrument. Moreover, the device can be used to learn the wind velocities above or within clouds, which conceal the upper sky, as well as to indicate the temperature and humidity of the air for altitudes up to nearly twelve miles.

The new equipment of the bureau is an improved type of radio meteorograph; a tiny balloon bearing aloft a small radio transmitter which has characteristic signals for temperature, humidity and altitude. These signals are received and recorded automatically on instruments on the ground. Previous radio meteorographs have operated the switching mechanisms by clockwork devices or by a small electric motor which needed a battery to run it. The new design operates entirely without external power and uses the power of varying barometric pressure, as the balloon rises, to accomplish the switching. The attachment to the radio balloon device which makes it possible to learn cloud thickness is a small photoelectric cell that records light brightness. As the balloon rises up to the under side of the cloud the photocell gives a reading characteristic of the light brightness found there. When the balloon enters the cloud the light brightness falls sharply and gradually increases until the upper surface of the cloud is reached and the instrument comes out into the brilliant sunshine found there. Since the light brightness for each altitude is transmitted by the balloon and received on the ground the thickness of the cloud can be accurately estimated although the cloud is miles overhead.

Moreover, by using a delicate directional antenna on the ground receiver, it is possible to follow the flight of the balloon, even though it is hidden by clouds. This angle above the horizon and the line of direction horizontally when coupled with knowledge of the altitude at the instant when the "sight" was taken, make it possible to fix in space the position of the balloon and its radio transmitter. A short time later, when the balloon is higher, this process is repeated and the drift of the balloon due to upper air winds can be calculated easily.

The only way this knowledge can at present be obtained by balloon flights is to make two observations of the balloon from two distinct stations by the use of small telescopes. This method naturally will not work in bad weather when it is impossible for the observer actually to see the balloon. Yet this cloudy, bad weather condition is exactly the one which aviation needs most to surmount. At present much of the knowledge of upper air weather is achieved by daily airplane flights in many parts of the country specifically for this purpose. These flights are costly, however, and average, it is estimated, about $25 apiece. The National Bureau of Standards believes that with a semi-mass production of the radio meteorographs the cost can be decreased.

THE ANNUAL CONGRESS ON MEDICAL EDUCATION OF THE AMERICAN MEDICAL ASSOCIATION

APTITUDE tests for students wishing to enter medical schools and stiffer examinations for medical students during and at the end of their course were urged at the annual congress on medical education of the American Medical Association. The tests are designed to test the student's ability to learn medicine and to forecast whether he will be a good or poor student. Results of the test must be considered together with college grades and other appraisal of the student. The aptitude test attempts to depart from the beaten paths of regular examinations, in order to determine what is left of the previous knowledge and experience of the student after most of the forgettable things have been forgotten. The test aims to measure the ability of the student to apply his knowledge remote from its usual context and thus again to distinguish what has become a part of the student from that which became part of an animated phonograph. At the same time this tests the ability of the student to face new situations on his own. It sets certain rather difficult study tasks, not requiring any previous knowledge of the subject, but testing ability to handle the sort of tasks with which the medical student is faced; and finally the whole test is a test of the ability to work under some pressure, which is so necessary in the study of medicine.

One of the speakers, Dr. Howard T. Karsner, of the Western Reserve University School of Medicine, said that the thorough examination of the medical student is a safeguard to the public. While not minimizing the importance of character and personality development, Dr. Karsner expressed doubt that these can be instilled by teaching, and asserted in no uncertain terms that the chief function of medical schools is to teach medicine. Any suggestion that the art of practice is distinct from

the science of medicine is false. Fundamental to that art and essential to it is science.

The essay type of examination, in which the medical student is asked to discuss one or two medical questions, was severely criticized by Dr. Robert P. Dobbie, of the University of Buffalo School of Medicine. Grades based on this type of examination are thoroughly unreliable and of little or no use in determining the general ability of a student. Dr. Dobbie submitted 123 such manuscripts or examination papers to four examiners for grading. The result was complete confusion. The grades given the same paper by the four competent examiners differed by from ten to fifteen points. When two of the same examiners regarded the papers five months later, the situation was more confused. Papers which had been passed the first time were failed the second, and the reverse.

BIRD MIGRATION

DR. ALEXANDER WETMORE, of the U. S. National Museum, found both eastern and western North American birds during a six-weeks' expedition to study the birds of Guatemala, from which he has just returned. In the highlands of the Central American republic, the first birds seen were from the United States, there for the winter, or in transit through the funnel-throat of Central America on their way into the wider forest of South America. Over 200 species of North American birds are known as winter migrants in Guatemala. And since Atlantic and Pacific are not very far apart in the Central American region, bird species characteristically at home in the Alleghenies there fraternize with other species that never nest east of the Rockies. Dr. Wetmore often saw in the same Guatemalan tree, birds that would never be found within a thousand miles of each other when they are at home. He also found in the pine and oak forests of the Guatemalan mountains many genera of birds close of kin to North American birds, but distinctively Central American, never straying northward. Such familiar fowl as woodpeckers, kingfishers, song sparrows, swifts, hawks and owls were found mingled with trogons, motmots and other birds not found in the temperate zone.

On one lake six specimens of helldivers, or grebe, very similar in coloration to the common helldiver of the United States and Canada, but very much larger, were collected. This lake is the only place in the world where this giant grebe is found. An oddity of bird behavior noted in one place visited was the eating of avocados by a species of black vulture, which elsewhere feeds only on a flesh diet. The avocados of that particular locality are of extra choice quality, but since they retail at only a quarter of a cent apiece the growers do not trouble to harvest their whole crop. Hence, whenever a gust of wind shakes a grove, a lot of over-ripe fruits drop to the ground and burst open with loud pops. Whereupon the waiting vultures in the treetops drop to the ground also and feast on the rich pulp.

ITEMS

NEW methods of examining undyed yarns developed by Professor Edward R. Schwarz, of the Massachusetts Institute of Technology, show the history of the yarn and even its age when picked. Polarized light and the microscope are the tools of the new technique which is revolutionizing the art of selecting yarns for textiles. Undyed yarns are nearly colorless in ordinary white light, but when examined with a microscope and polarized light they exhibit various brilliant shades of color in different places. These colors are the tell-tale signs of immature fibers. In the case of cotton, particularly, "unripe" fibers are weak and must be detected quickly. Even man-made rayon is not perfect and the weak spots in rayon yarns can similarly be detected by the method. Weaving the yarn into cloth does not destroy the evidence of defects and the scientific detective method not only can tell how good the yarn is, but also how well the weaving is done.

THE use of the powerful eye of the spectroscope to analyze metals in industry, particularly in testing steels and alloys for impurities, was explained to the symposium on metals at the Massachusetts Institute of Technology by Professor George R. Harrison, director of the laboratory of spectroscopy. Necessity of accurate analysis is emphasized by the current method of making steel which uses much scrap iron and steel reclaimed from junk yards. Usually different types of scrap are melted together and this the resulting alloys are not always of the constitution desired. Even such small amounts as one part in ten thousand of some metals, such as aluminum or magnesium, will greatly alter the properties of steel. Thus the inclusion of one old automobile crank case of the wrong type may spoil tons of steel. The spectrograph constitutes a quick and accurate method of checking steel for such impurities. Placed on a routine basis, this method is much more rapid than ordinary chemical methods with complete analyses possible within 15 minutes, an important factor when several hundred tons of steel are being melted. Whole trainloads of ingots have been analyzed in a few hours by a clerk trained to use the instrument.

J. B. NEWSOM, mining engineer of the Idaho Maryland Mines Corporation, reported at the meetings of the American Institute of Mining and Metallurgical Engineers his success in drilling a hole 1,125 feet deep with a core five feet in diameter. The future possibilities of this method are great. When the 1,125-foot level is attained a chamber can be hollowed out and operations repeated for another 1,125 feet, and so on. From a little shack a 40 horsepower motor rotates a core barrel by means of a vertical shaft. The cutting is done on the bottom rim of the barrel by cutting teeth. As sections of rock are cut they are hoisted up the shaft. Other topics up for discussion include aerial prospecting and the transportation by air of mining equipment to distant, inaccessible parts of northern Canada and Alaska; the use of electrical prospecting to detect vast ore deposits now buried deeply under the earth covering piled up by the great glaciers ten thousand and more years ago; a method of using supersonic, or unheard, sound waves of very high frequency to settle smoke dusts in smelters which has the interesting possibility of being also used in war time to settle enemy smoke screens and as a means of clearing up fog at airports.