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NEW LINES IN ECLIPSE SPECTRUM

MANY bright lines, never before observed and each indicating the presence of some chemical element, have been found in photographs made of the red and infra-red light from the sun at the time of the total eclipse of January 24 by Professor H. D. Curtis, director of the Allegheny Observatory of the University of Pittsburgh, it was announced recently. These photographs were made at New Haven, Connecticut, where Dr. Curtis accompanied the eclipse expedition from Swarthmore College. They were made both of the flash, the outer layer of the sun which can only be seen just before or just after totality, when the remainder of the sun's surface is covered by the moon, and of the corona, which is only visible when the sun is completely covered.

The apparatus used is a grating spectrograph in which a curved piece of metal on which are ruled many fine parallel lines, 3,600 to the inch, takes the place of the usual glass prism in spreading the beam of white light out into a colored spectrum. Dr. Curtis states that this apparatus is especially adapted to recording the spectrum in the deep red region, and the part beyond, called the infra-red.

The deepest red waves visible to the eye are about one thirty-three hundred thousandth of an inch long, and the longest previously recorded in the flash spectrum are about one four millionth of an inch in length. Dr. Curtis's plates show many lines, up to those corresponding to a wave length of about one twenty-eight hundred thousandth of an inch. Among these are many lines never before observed. Some of them have been identified as being due to elements known on the earth, while several can not be found to correspond with any known element. One of them, found in the coronal spectrum, Dr. Curtis stated, may possibly be due to the element coronium, known only in the sun's corona. It is believed that similar photographs, made at another eclipse, will throw much light on their origin.

METABOLISM OF CRYING BABIES

WHEN a baby cries it means hard labor for himself as well as for his afflicted parent. Drs. J. R. Murlin, R. E. Conklin and M. R. Marsh, of the University of Rochester, have been conducting careful measurements of the energy used up by crying babies, and they find that the metabolism, or rate of food-use, by crying babies is markedly higher than that of infants contentedly cooing or sleeping in their cribs. Crying one per cent. of the time increases the use of energy one per cent.; so that if a baby cried all the time it would double its energy requirements and hence the amount of food it would need.

Assuming that a child could keep up such a distressing performance for a day and a night and assuming further that one fifth of the energy could be transferred into muscular work, the doctors calculated that on this basis this imaginary long-time squaller could develop enough power to lift himself to the top of the Washington monument.

Just how far the harassed father would walk in that time or how much energy he would use up in the process, the doctors do not state. They do, however, draw the practical conclusion that crying is a very wasteful process as well as an annoying one and that economy as well as comfort requires that babies be so cared for that they have little occasion to cry.

WATER POWER DEVELOPMENT

BECAUSE of Canadian governmental policy against exporting power it is probable that the St. Lawrence River project and the Carillon project, an undertaking larger than Muscle Shoals and requiring the exporting of power from the Ottawa River, will be blocked indefinitely, according to information reaching the United States Department of Commerce.

With the completion of these plans, power would have been furnished the manufacturing districts in New England at a figure below the present cost. Only one third of the expense of the St. Lawrence plan could be borne by the United States, however, as not more than sixty miles of the mileage of the proposed development are a part of the international boundary line.

The St. Lawrence project is a combined waterway and power development plan worked out by a group of American and Canadian financiers. For power development a super power plant would be built at the base of Lake Ontario. This super power plant would have to produce 300,000 kilowatts per hour or one half of the power produced on both sides of Niagara Falls. The waterway plan would, by deepening the channel of the St. Lawrence, link the Great Lakes with the sea.

Closely allied to and almost a part of the St. Lawrence scheme is the Carillon project. A huge power plant would be built at the small town of Carillon on the Ottawa River. Power from this plant could supply not only prospective Canadian needs but most of the eastern United States as well. The Ottawa River flows between the provinces of Quebec and Ontario and the premiers of these two provinces are bitterly opposed to the plan. Since the money for the initial payments on the work has been raised and since the project is so large it is probable that the Dominion government will make the final decision.

An important step in super power that seems likely to materialize is the ratification of a power treaty contracted by New Jersey, New York and Delaware. These states have agreed among themselves to share the power of the Delaware River, and it remains for the legislatures to ratify the agreement. Metropolitan New York will benefit most from the plan as extra power will come in from the Delaware watershed.

"Water power developed in small companies is not cheap power but requires an enormous outlay for power

houses and coal,'' said Paul S. Clapp, secretary to the Northeastern Super Power Committee. ''By concentrating these power houses at a number of centers much of this expense will be eliminated, as coal can be bought in large quantities and stored, larger and more efficient machinery can be used and arrangements can be made for transferring the amount of energy needed for peak loads from one plant to another.''

The Northeastern Super Power Committee, organized by Herbert Hoover, secretary of commerce, in the interest of eliminating waste, consists of representatives from New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania and Maryland. Investigations were made as to the feasibility of a power system connecting these states in an interlocking system. The northeastern part of the United States was chosen as a field for investigation because sixty per cent. of the manufacturing is carried on in them and they have forty per cent. of the population.

''The United States naturally divides itself up into power areas,'' Mr. Clapp continued, ''and will have to be developed as such. We chose the northeastern part of the United States to make our survey because of its industrial importance. We found that about thirty-eight per cent. of the water supply had already been developed and that not more than twenty-five per cent. of the total supply could come from water alone.

''Water is not a constant thing; varying with the weather, it is sometimes impossible to carry out the power contracts undertaken by the companies. Undoubtedly most of the future power development rests with steam.

''Power at the mines, however, is not the answer to the question as it is usually impossible to get water in sufficient amounts to condense the steam. Experiments with super power in Germany have attempted the use of the power at the mines plan but it was found that pumping the water and forcing it down water towers is an overwhelmingly expensive process.

''Super power or giant power means interconnection and consolidation of stations and is necessary in all areas of the country.''

DIPHTHERIA

In spite of the terror in which it is held, diphtheria is probably the most studied and best understood by the medical profession of all the diseases that afflict mankind. The causal organism has been known for a long time, its action also is known and the toxin or poison it secretes has been studied. Physicians have learned how to prepare an antitoxin that neutralizes the toxin when the disease has already gained headway, they have devised a method for determining which individuals are naturally immune and which are liable to the disease and lately they have worked out a way of rendering non-immune children safe against it for years and perhaps for life.

The germ of diphtheria was discovered in 1883 by Klebs and Loeffler, two German scientists. It is a short rod-shaped bacillus, slightly curved and frequently club-shaped. It is visible only under the most powerful microscopes for it is only about a thousandth of an inch long. It is present in immense numbers in the throats of diphtheria patients but it is also found very frequently in the mouths and throats of perfectly healthy persons. Such persons may be naturally immune, so that they will never get the disease and simply act as ''carriers'' for the germs; such immune carriers are frequently a great danger to a community. Or, a susceptible person may carry the germs about with him for a long time; then suddenly develop diphtheria when for some reason his resistance falls.

The symptom people most readily associate with diphtheria is the formation of a ''false membrane'' in the throat which threatens to strangle the patient. More serious, however, is the secretion of a poison, or toxin, by the bacteria. The bacteria do not invade the patient's blood stream themselves but this toxin is poured into it and causes serious disturbances in all parts of the system which may result in death. By cultivating the germs on special food substances in the laboratory an extract containing this toxin can be prepared, which is of use in studying the disease but more especially in preparing antitoxin to cure it.

Normally, when the toxin finds its way into the blood, the body tissues secrete a substance that neutralizes it. This is the antitoxin. Antitoxin is formed whether the toxin gets into the blood naturally, through an infection in the throat or whether it is introduced by injecting the laboratory extract. The natural formation of antitoxin is what protects persons who are said to be naturally immune and it is also the cause of spontaneous or natural recovery from an attack of diphtheria. Most children are naturally immune when they are born; probably antitoxin from their mother's blood passed into their bodies before birth. This ''natural born'' immunity passes off before the child is one year old and leaves most children highly susceptible. The highest diphtheria rate occurs among children between three and four years old. During childhood and especially during adolescence most people build up natural resistance, apparently by receiving and throwing off slight infections and thereby storing up reserves of antitoxin in the blood or at least by ''forming the habit'' of making their antitoxin quickly when an infection occurs. Very few adults die of diphtheria.

Antitoxin generated in one person or animal may be transferred to another. This is taken advantage of by the preparation of the serum now widely used, the discovery of which is credited to Behring and Roux—a German and a Frenchman. Doses of diphtheria toxin are injected into sound and healthy horses and after they have had time to develop antitoxin a certain amount of blood is drawn off. The animals are well treated and often yield antitoxin material for many years. The blood is cleared of all but the watery serum, which is sterilized and tested on guinea pigs, and then sealed up in glass tubes ready for medical use. During the first five years of the use of antitoxin the death rate from diphtheria

fell off fifty per cent. and during the next ten or twelve years the remaining rate was again halved.

The Schick test, which shows whether a person is susceptible to diphtheria, consists simply of injecting a very tiny quantity of the toxin into (not under) the skin. If the child is immune nothing happens; if susceptible, a redness and subsequent "peeling" of the skin indicates a "positive" reaction. Sometimes there is a false, or "pseudo" reaction; but physicians can easily detect this. This test was devised in 1913.

Still more recent is the use of a mixture of toxin and antitoxin, carefully balanced as to strength, and injected into the arm. This treatment was worked out by Dr. Wm. H. Park, of New York, only about five years ago and is the most recent step in the conquest of diphtheria. For some reason, an injection of antitoxin does not give permanent immunity; after a few weeks the effect wears off. But the use of the toxin-antitoxin treatment seems to give permanent protection; certainly the immunity thus acquired has not worn off in several years in the cases where it was first used. Persons who were given the toxin-antitoxin treatment and subsequently Schick-tested proved to be immune in 97 per cent. of all cases.

The Schick test and the toxin-antitoxin treatment where needed, are now used on all school children in many communities. However, that only partly meets the situation, for the greatest danger from diphtheria comes before school age—around three years. When the public in general shall have been educated to an understanding of the value of testing and immunization for very young children, diphtheria will become as extinct as the dodo.

COCAINE ADDICTS

HUMAN beings can not continue taking cocaine indefinitely nor can a tolerance to this dangerous drug be built up as is commonly supposed, Professor A. L. Tatum, of the University of Chicago, has found as a result of experiments and observations in the university laboratory of physiological chemistry and pharmacology.

Taking cocaine away from a habitual user has no more disastrous effect than taking tobacco away from a confirmed smoker, Dr. Tatum maintains, since the body does not require the continuance of the drug once it has been withdrawn. The contrary is true of morphine, the drug to which cocaine addicts often turn.

Experiments recently completed on laboratory animals show that cocaine addicts, after a considerable period of time, suffer from a poisoning which produces tissue degeneration, causing painful physiological reactions that force them to abandon the habit.

"Cocaine administered to laboratory animals develops an increased sensitivity toward the drug," Professor Tatum explains. "This is in confirmation of results obtained by other investigators. Cocaine poisoning over a considerable length of time produces tissue degeneration. Similar degenerative change produced by other means, such as phosphorus or chloroform poisoning, increases the sensitivity toward cocaine.

"Consequently it is our view that the increased sensitivity in laboratory animals has its basis in cell injury."

Addicts "cured" of the cocaine habit can go back at once to the dosage used at the height of their so-called addiction with no excessive or exaggerated effects, contrary to morphine addiction in which case after a cure the subject must begin again with a small dosage with gradually increasing dosage as he redevelops a tolerance.

Cocaine addiction is usually of relatively short duration, estimated from one to three years, when the subjects voluntarily stop the use of cocaine because of the undesirable effects.

The absence of a developed human tolerance, lack of abstinence symptoms on withdrawal and the short course of the addiction, all point to a similarity of bodily effects on man and laboratory animals; man and laboratory animals differ essentially in their psychic reactions which is the basis of the human addiction. The lower animal counterpart of the human cocaine psychosis has so far never been discovered.

ITEMS

AN accurate measurement of the refraction of X-rays has recently been made by Professor Bergen Davis and his co-workers at Columbia University. The bending of the rays at the surface of matter is very small but by proper refinements of apparatus it can be measured quite accurately. These measurements permit the computation of the number of electrons in the inner level of an atom. The number found is two, in agreement with the Bohr scheme of atomic structure. The possible refraction of X-rays was indicated by the experiments of Stenstrom a few years ago. Recently Professor Manne Siegbahn, of Upsala, Sweden, succeeded in showing this refraction directly by the bending of the rays in passing through a glass prism.

THE French Minister of Colonies has set aside, by executive decree, a number of islands owned by France in the Antarctic regions as game sanctuaries for polar bear, walrus, sea lions and other animals. The protected area includes the islands of Crozet, St. Paul and Amsterdam, Adelia Land and the Antarctic coast between Doigt de Sainte Anne and Port aux Lapins.

AN Albert National Park in the Belgian Congo will be created in the near future by royal decree. The region selected is a high table-land between Lake Kuon and Uganda. Protection will be given to both animals and plants, and hunters will be forbidden to penetrate into the region.

THE presence of some of the rarer elements in petroleum ash has been demonstrated in experiments now being conducted by chemists in the Department of the Interior. The spectroscope has revealed a strong lithium line, indicating the presence of a valuable element whose presence was not previously suspected. Nickel is also plentiful, as is vanadium; it is even thought possible that the ashes of petroleum cokes may be utilized as future sources of vanadium and nickel.