

SCIENCE NEWS

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THE AGE OF THE SUN AND STARS

THAT the sun is only two billion years old, and will probably live to the age of twelve billion, is the opinion expressed by Dr. George Gamow, professor of physics at George Washington University, in an interview during the General Electric Science Forum program broadcast from Schenectady on October 28.

"Probably the best proof," Dr. Gamow said, "of the view that the entire stellar world had a definite beginning in some distant past can be found in the observations of Dr. Hubble, of the Mount Wilson Observatory. His results indicate that the large stellar groups, known as island universes, and similar in their nature to our stellar system or Milky Way, are receding from each other at a rather high speed. From the observed velocity of the recession, one can easily calculate that the separation of these giant stellar clouds must have taken place only about two billion years ago." At some period before that time, the matter of the stars formed one continuous mass of hot gas. "The epoch when this primitive gaseous chaos was broken up by the process of progressive expansion into the separate stars can be truly considered as the period of the physical creation of the world. In particular, the formation of our earth, which, according to geological data, is just about two billion years old, also falls within the same period."

Dr. Gamow rejected the hypothesis that the distances between the stars had always been substantially what they are now and that the earth and the other planets had been formed in a violent collision between our sun and some other star. Calculations show, he said, that such an event is then so extremely improbable that hardly more than one collision could have occurred during the entire past of stellar existence. If, on the other hand, the stars two billion years ago were very close together, collisions would have been frequent, and suns accompanied with planets would now be the rule rather than a most extraordinary exception.

Dr. Gamow pointed out that the sun lives by the alchemic conversion of hydrogen into helium. This is the source of its light and heat which it expends so lavishly. It is atomic power on the grand scale—which we on earth have only succeeded in imitating microscopically. It is the same with the other stars. Since hydrogen is the fuel of the stars, their probable life spans can be predicted on the basis of how much they have on hand and how fast they are expending it. Our sun is now about 35 per cent. hydrogen, and at the present rate of consumption this will last for another ten billion years.

SUNSPOTS

THE coming minimum in the eleven-year solar cycle expected to occur within the next three years will give astronomers a chance to check again on one of the sun's greatest mysteries—the sudden reversal in the magnetic polarity of sunspots. Dr. Seth B. Nicholson, of the

Mount Wilson Observatory, in a report to the Astronomical Society of the Pacific stressed the importance of future research in this field.

So far the effect has been observed only three times. Although discovered twenty-nine years ago by the late Dr. George Ellery Hale, formerly director of the observatory, no satisfactory explanation of the phenomenon is known.

Dr. Nicholson explained that sunspots almost always occur in pairs having opposite magnetic poles, like the ends of a horseshoe magnet. At present in the sun's northern hemisphere the western half of a spot-group has a polarity like the north-seeking pole of a magnet. But this condition will be reversed for spot-groups of the new cycle if they behave as they have at previous minima. He concludes that "despite the fact that we have accumulated a vast amount of exact information about the way sunspots behave, we still know very little about what makes them behave that way. We may reasonably hope that some of the most fundamental questions of physics; chemistry and astronomy may be illuminated by an intensive study of solar magnetism."

SILVER AS A SUBSTITUTE FOR COPPER IN ELECTRIC WIRING

SILVER, now lying idle in government vaults, could be economically substituted for copper in the electrical equipment of the new aluminum and magnesium plants now being built and thus help to relieve the present acute shortage of copper, was pointed out by Robert E. McConnell, chairman of the Engineers Defense Board, New York City, in an address to the American Institute of Chemical Engineers at Virginia Beach.

The government owns 100,000 tons of silver, Mr. McConnell continued. Silver is an even better conductor of electricity than copper. It would cost very little to convert the government ingots into bus bars and wire. The silver would be as safe as in the vaults. The plants will operate twenty-four hours each day. They will be guarded. Besides, the wires will be alive all the time. When the emergency is over the silver conductors can be replaced by the more conventional copper ones, and the silver put back into the vaults.

Twenty-five thousand tons of copper could be saved in this way in the new aluminum and magnesium plants, and another 50,000 tons could be saved in the same way in other plants requiring large conductors of electricity. The shortage of copper will cause more inconvenience and dislocations than will be caused by any other shortage. It has become acute in the last six months and the prospects are that it will become worse. Recent estimates are that the total productive capacity of the Western Hemisphere south of Canada will be required for military purposes alone.

Current production of new copper in the Western Hemisphere is 1,600,000 tons a year, an all-time peak. Non-defense needs run about 1,000,000 tons a year. But 1,-

300,000 tons are wanted for defense, leaving only about one fifth for the normal non-defense needs.

For many uses there is no substitute for copper. Practically the only metallic substitute is steel. In some cases glass, plastics, wood or fabric can be substituted. Mr. McConnell believes that substitutions should be made wherever possible, and further that many economies can be made in the use of copper both in defense and in non-defense industries.

TOOTH DECAY

DEAF SMITH COUNTY, in the Texas "panhandle," may give the world a chemical formula for preventing tooth decay, it appears from preliminary studies reported before the Houston, Texas, meeting of the American Dental Association, by Dr. Edward Taylor, director of the dental division of the Texas State Department of Health.

The sound teeth of residents of this county so impressed a dentist in one of its towns, Hereford, that he suggested a study of local food and water intake might prove valuable. Following this suggestion, the teeth of 43 native-born continuous-resident persons in and around Hereford, chosen at random by a teacher and an NYA worker who knew nothing of local conditions, were examined. Not a single decayed tooth or filling was found in the teeth of these people, whose ages ranged from two years to past middle age. Equally if not more impressive was the finding that people who moved into the county from other states, with the usual number of cavities and fillings, after having lived there a few months ceased to develop further caries. Even a few cavities in teeth brought there as much as five years previously with active decay had ceased to be active and the cavities had acquired hard, glazed floors and surfaces.

Tooth decay in Deaf Smith County, according to conclusions reached so far, is only about half as much as the lowest amount heretofore reported in the United States and much lower than the average.

Deaf Smith County is part of a high level plain, the top soil a dark, sandy loam, below which there is clay containing a high percentage of calcium carbonate. Moreover, wheat ground in Hereford mills has a high protein content, and is about six times as high in phosphorus as the average standard flour. Milk samples at a local creamery contained 30 per cent. more phosphorus than accepted standards.

"This indicated that possibly all vegetables, dairy and meat products of the area are comparably high in these elements so necessary to building and maintaining tooth tissue." Dr. Taylor noted that every rural and many of the urban homes have one or more windmills, drawing water from a depth of 70 or 80 feet—water that has abundant fluorine and calcium. He believed that a formula could be arrived at which would produce a high degree of immunity to tooth decay by the proper combination of fluorine, phosphorus, calcium, vitamin D and possibly other factors in the food and water intake.

ITEMS

THE number of machines produced in the United States last year shot up from a normal annual production of

25,000 to 100,000. By the end of this year production is expected to approach the 200,000 mark, according to a report issued by the National Machine Tool Builders Association. Such great advances have been made in the speed, power and efficiency of cutting tools and in the design and degree of automatic operation of the machines employing them that new machines are estimated to be on the average three times as productive as machines of older designs.

DANGEROUS static electricity that develops on automobiles can be reduced by injecting two grams (15 grains) of a special conducting powder into the inner tube through the valve stem, according to a report by S. M. Cadwell, N. E. Handel and G. L. Benson, of the United States Rubber Company, to the American Chemical Society. The powder distributes itself and adheres to the walls of the inner tube, forming a continuous conducting layer. This does not prevent the generation of static electricity on the tire tread, but the negative charge on the tread induces a positive on the conducting layer, and the strong attraction between these two charges of opposite sign reduces the charges that would otherwise be induced on the body of the car. Road tests of cars whose tires have received this treatment reached a maximum of 1,200 volts on the car, and the charge disappeared quickly on standing. This is to be compared with 5,000 to 7,000 volts generated on cars whose tires had not been treated.

MINUTE structures in the tiny anatomy of an insect, hitherto unknown and unsuspected, have been disclosed under the hundred-thousand-fold magnification of the electron microscope, in the RCA laboratories. The breathing tubes in the sides of a mosquito's body are shown to be lined with elastic hoops a fifty-thousandth of an inch broad. These in turn are covered with sub-microscopic spines less than a quarter-millionth of an inch high. Other submicroscopic studies are being made on skin, wings and bristles of butterflies, bees, flies, beetles and cockroaches. The powerful instrument is being used to disclose details of the shells of their tiny eggs.

ENGLAND had the highest marriage rate in its history last year, according to the report of a statistician of the Metropolitan Life Insurance Company. The marriage rate was nearly 30 per cent. above pre-war level. The birth rate this year is continuing a downward trend, but the decline that was slight last year is now a sharp drop. In the first six months of 1941 the birth rate in England's cities fell off 20 per cent. compared with 1940. Infant mortality this year is high in England, because communicable diseases have been prevalent. Measles was abnormally prevalent in the first half of 1941 and whooping cough, also. Diphtheria cases were increasing to a lesser extent. There conditions have improved considerably during the summer, however, aside from the whooping cough situation. Civilian air raid deaths for all England in the first eight months of 1941 were 19,078. Deaths from bombing during August were 169, or less than the daily average during April and May.