

SCIENCE NEWS

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THE EXPLOSION OF STARS

THE conclusion that the sun will eventually explode seems a certainty, according to Dr. George Gamow, professor of physics at the George Washington University and one of the investigators who have helped astronomers to understand the alchemical process by which one element is changed into another to keep the sun and other stars fueled. However, this explosion, which will instantly convert the earth into a cloud of hot gas, is not likely to come soon, for Dr. Gamow assures us that it is not likely to happen for several billion years at least.

About twenty times a year astronomers, through their telescopes and occasionally with the naked eye, discover a "nova" or new star. Some of these are "super-novae," many times more brilliant than the common variety. Dr. Gamow thinks that the difference between the two kinds is merely one of the mass of the original star. "Whereas the explosion of such a giant star as Sirius," he says, in a report of his theory to *Popular Astronomy*, "would lead to a very brilliant supernova comparable with the 'star of Bethlehem,' the explosion of our own sun, which is known to be a middle-weight star, would be probably classed as an ordinary, common nova. This will make, however, but a very little difference for the population of the earth, since in both cases the increase of solar heat will be quite sufficient to turn our planet instantaneously into a cloud of hot gas!" With twenty novae a year, and our Milky Way system of stars about two billion years old some 40 billion stars in this system have already exploded. He estimates that there are between 40 and 80 billion stars in the system, so that "the chances of explosion for any individual star are fairly high."

It has been established, "beyond any doubt," according to Dr. Gamow, that transmutation of elements, for which the ancient alchemists sought in order to transfer base metals into gold, is the source of stellar energy. In the case of the sun, hydrogen is changed to inactive helium. Dr. Gamow's work has shown, paradoxically, that as the supply of hydrogen fuel is used up, the sun gets hotter, and the remaining fuel is burned faster. "When the solar hydrogen content drops from its present value of thirty-five per cent. down to one per cent. the sun will become about 100 times as bright as it is now." This will make rocks on the daytime side of the earth as hot as the kitchen stove, the oceans will boil, and human beings, if they have not been able to migrate to a more comfortable planet, will have to "spend most of their time in air-conditioned underground shelters. Fortunately enough the above described picture corresponds to a very distant future indeed, since the consumption of hydrogen and the increase of solar brightness are going on extremely slowly. It has been estimated, in fact, that the chemical reaction producing the radiation of the sun consumes about 0.000000001 (one-billionth) per cent. of solar hydrogen per century, so that it will be several billion years before this amount will be essentially changed before the sun will become hot enough to set the oceans boiling!"—JAMES STOKLEY.

A NEW PROCESS OF MAKING LIQUID AIR

By making compressed air work as it expands, a new method of making liquid air has been developed by Professor P. Kapitza, of the Institute of Physical Problems of the Academy of Sciences of the U.S.S.R. in Moscow. A brief description of the process, based on a paper in a Russian journal, is printed in *Nature*.

All commonly used methods of refrigeration, whether in home refrigerators or machines for liquefying gases, make use of the same principle. This is that when a gas is compressed, it is heated; when the pressure is relaxed, it cools to about what it was at first. If it is compressed, then cooled, then decompressed, it drops to a temperature considerably below what it was originally.

Since the nitrogen making up most of the air has a boiling point (where it changes from liquid to gas) of 320 degrees below zero Fahrenheit, it must be cooled to this low temperature to liquefy it. This is done in several steps of compression, cooling and expansion, each one carrying it down some more. The Linde machine, widely used, uses pressures as high as 200 times that of the atmosphere.

It has been realized, however, that if, instead of merely allowing the gas to expand, it was made to do some work at the same time, still more energy would be removed from it, and the cooling would be still greater. Professor Kapitza has done this, by making the expanding gas drive a turbine. With this system the necessary cooling can be obtained with an initial pressure of only 5 atmospheres, instead of 200.

In the present Kapitza machine, the turbine revolves at 40,000 revolutions per minute. About 30 kilograms (66 pounds) of liquid air can be produced in an hour, using about 1.7 kilowatt hours of electricity in power for each kilogram. By utilizing the mechanical energy from the turbine, and with improved valves, it is thought that this may be reduced to 1.2 kilowatt hours per kilogram, about the same as with present machines using high pressures. Working on a larger scale, with smaller heat losses, Professor Kapitza expects to be able to make it still more efficient.

In any event, the writer points out, the Kapitza outfit has many advantages. It can be started in 20 minutes or less, is small in size, and does not need the many auxiliary attachments of the high pressure apparatus.

THE SUPPLY OF CHLORINE

THE safety of your drinking water, your swimming pool and the cleanliness of the drink you obtain at a roadside stand are being protected despite the shortage of chlorine. Correspondence between Dr. Thomas Parran, Surgeon-General, and the Director of Priorities, E. R. Stettinius, Jr., shows that there is plenty of chlorine to take care of the needs of public health. The only danger to the supply for water works and sanitation seems to lie in an unfounded fear that a shortage will develop. Acting on this fear, some buyers are overstocking, thus tying

up containers. Lack of these containers may slow up the filling of new orders.

Public health uses of chlorine have been put on a par with defense needs by the Office of Price Administration and Civilian Supply. Adequate supplies are insured for water purification, sewage treatment, sanitation, refrigerant gases for existing equipment, slime control in industrial plants, preparation of products for medicinal use, preservation and processing of food products.

Not specifically mentioned in this provision is the use of chlorine by many soda fountains, roadside stands and bars for the sterilizing of dishes and glasses where steam or boiling water is not readily accessible. Chlorine is also widely used on dairy farms and city milk plants to kill bacteria in containers and to sterilize the hands of milkers and the udders of the cows before milking. For these purposes, a dry form of chlorine—sodium hypochlorite or calcium hypochlorite—is used, not the liquid chlorine commonly used as a bleach as well as a disinfectant. The OPACS is depending on distributors of this dry chlorine to see to it that these important public health needs are adequately filled.

Public health officials know of no substitute which will kill the germs and not endanger humans. They warn that without careful sterilization of milk containers, drinking glasses and dishes, there would certainly be a spread of many diseases carried in this way, including colds and influenza, tuberculosis, typhoid fever and paratyphoid fever, septic sore throat, diphtheria and scarlet fever.

Of the present production of chlorine, it is estimated that about 30 per cent. will go for defense. Only about 5 per cent. to 7 per cent. is needed for sanitation. It has been put up to the housewife, the laundry and the paper manufacturer, who use chlorine as a bleach, to cut down their use of chlorine so that neither public health nor defense uses need be curtailed.

SLEEPING SICKNESS AND INFANTILE PARALYSIS

THE sleeping sickness (encephalitis) outbreak is spreading. Four states have reported cases to the U. S. Public Health Service in Washington.

In North Dakota, where the outbreak started, the cases were fewer for the week ending on August 2. There were 54 cases there as compared with 65 for the week ending July 26. But Minnesota reports 35 cases in that state. In South Dakota there were 19 and in Colorado, three. The cases in North Dakota were scattered generally throughout the whole state instead of being concentrated mostly in Cass County as they have been previously. Of the 54 North Dakota cases reported for the week ending August 2, only eight occurred in Cass County.

Infantile paralysis is also spreading. In the southern states, where the outbreak has been most serious, a decline in the number of cases is reported.* But increases have been reported for New England, Maryland, New York, New Jersey, Pennsylvania, Ohio and Illinois.

New England had 16 cases during the week ending August 2, including four in Maine, five in Massachusetts, one in Rhode Island and six in Connecticut. In the previous week there were only four cases—two in Massachu-

setts and two in Connecticut. Before that there had been none. Maryland had 14 cases, as compared with three the previous week, and of these nine were in the city of Baltimore. In Pennsylvania, the number climbed from eight to 15; New York from 11 to 12, and New Jersey from two to five. Ohio reported an increase from 11 to 16; Illinois from four to 13, and Michigan from seven to eight. Indiana had a decrease from eight to five. California, which has been having a small number of infantile paralysis cases right along, reported a decrease from nine cases in the week ending July 26 to eight for the week of August 2.

The total number of infantile paralysis cases for the week ending August 2 was 326 as compared with 302 for the previous week. The increases in the North more than offset the declines in southern states. In Alabama and Georgia, where cases have been most numerous, cases have dropped from 58 (in Alabama) and 79 (Georgia) to 49 and 71. Tennessee reported a decline from 24 to 13 and Kentucky from 11 to seven.

VITAMIN B₁ IN THE BUDS OF TREES

LARGE quantities of vitamin B₁, the "morale vitamin" which exercises a beneficial effect on the human nervous system, have been found in the buds and leaves of many common American trees by Yale University botanists.

Using a constant temperature tissue culture laboratory for experiments, heavy concentrations of the substance were found in the buds of oak, red maple, horse chestnut, elm, sycamore and white pine trees. "Although vitamin B₁ is now produced by synthetic chemical processes, this discovery points to a large natural source of vitamin B₁," according to Professor Paul R. Burkholder. "This finding may offer a clue to the source of essential vitamins for many forest animals."

Professor Burkholder, who is conducting his researches in cooperation with Professor Edmund W. Sinnott, states that the vitamin seems to be formed in the young leaves and growing points of the shoot, whence it is transported through the bark into the roots and various portions of the plant.

Experiments in which basswood and maple trees were girdled, by removing a ring of bark from the trunk early in the spring, show that almost no vitamin B₁ has appeared below the ring in mid-summer. Yet huge quantities of the vitamin have been found above the ring. This seems to indicate that ultimately a girdled tree may die not only from lack of food but from vitamin starvation as well.

These researches show that most green plants contain sufficient amounts of the vitamin for their normal growth. The amount of essential minerals in the soil and sunlight apparently influence the amount of B₁ which green plants are able to produce. Vitamin B₁ is heavily concentrated in the buds of trees just as it is in grain. Recently, flour refiners have sought to increase the vitamin content of flour by restoring B₁ after refining has taken place in order to provide more of the material for the nation's health.

The amount of B₁ is measured by the amount of growth of a mold which is very sensitive and is used as an indi-

cator plant. Growth of the indicator plant will not take place unless vitamin B₁ is added, and the amount of growth varies directly with the supply of vitamins.

HAY FEVER

ALL allergy, like all Gaul, may be divided into three parts—three, because of the three principal avenues of entrance or points of attack. Allergic poisons may, in the form of cosmetics, chemicals or plant juices, penetrate the skin of the hands, face or other parts of the body and thus assault us from without. They may be swallowed, as food, and subsequently snipe at us from within. But the most common and most insidious offenders are those invisible enemies that pounce upon us from the air. They find our most vulnerable spots—the tender membranes that cover the eyeballs, and those that line the eyelids, the nasal cavities and the lungs.

With reasonable care we may usually succeed in avoiding unfriendly food and chemicals. But the aerial allergy attack by pollen grains, mold spores and buoyant insect scales is so wide-spread, so intense and long drawn out, that special personal defense measures must be taken. Nevertheless, a certain grim satisfaction may be had from the fact that there are few surprise attacks. All the major allergenic broadsides are loosed on well-developed schedules.

Over the northern and eastern states the blossoming dates are well synchronized, but in the south central and southern states the weeds usually come to maturity later than in the north. However, there are a few interesting local exceptions. The Arizona ragweed season occurs in the spring—March and April—instead of August and September. In southern Florida, on land where winter tomatoes and other vegetables are grown, common ragweed comes into full bloom in May. Wyoming has a small amount of ragweed pollen in the air in June and July. Along the Gulf Coast, from Tampa to Brownsville, ragweed pollination begins in September and drags along well into November.

If one were anxious to follow ragweed around the calendar and the map he could keep in close touch with it about nine months out of the year. He could dodge it almost completely by staying in Houston until about the last week of September and then changing his residence to some northern city. A non-stop flight from Houston to Minneapolis by plane at 10,000 feet altitude would do the trick.

Spores of certain kinds of fungi, principally molds, cause hay fever and asthma in just the same way as pollen, but not necessarily in the same persons. One man may be sensitive to certain pollens only, another to mold spores but not pollen, and still another to both pollens and spores.

It is possible to prevent the symptoms caused by mold spores. The skin testing and treatment are carried out in the same way and produce the same degree of benefit as pollen treatment. A graduated series of hypodermic injections brings the patient's tolerance to a high level before the season begins and the treatment is continued at regular intervals to keep up the tolerance through the season.—OREN C. DURHAM.

ITEMS

GREAT activity on the sun, with one spot big enough to be seen with the naked eye, through dark glass, was reported by the U. S. Naval Observatory in Washington. As a result, it is possible that in the next few days there will be magnetic disturbances on earth, and perhaps radio communication across the oceans may be affected. For Saturday, July 26, the Naval Observatory astronomers said, there were 96 spots in seven groups, which covered a total area of 43 square degrees. This is an unusually large number for this time, several years past the time of maximum sun-spots, which vary over an eleven-year cycle. Observers at the U. S. Coast and Geodetic Survey's magnetic observatory at Cheltenham, Md., stated that no unusual magnetic activity had yet been observed.

THE newest weapon that will be speeding across country to fight infantile paralysis outbreaks this summer, along with "iron lungs," splints and the like, is the laboratory on wheels of the School of Public Health of the University of Michigan. It will go to communities having no laboratory facilities, where infantile paralysis outbreaks frequently occur, and will be used to collect specimens needed in the search for a means of preventing or curing the crippling malady.

LIGHTWEIGHT radio sets are used in ever-increasing numbers by the rangers and fire-fighters of the U. S. Forest Service. The smallest and most compact is a set weighing less than six pounds and taking up about as much space as three quarters of a loaf of bread. This set is carried by parachute-jumping fire-fighters, who can talk to the plane that drops them or to headquarters. Longer-ranged and capable of standing rougher treatment is a short-wave set weighing 21 pounds, with a working range of 20 miles. Sets of this type will be used by a mapping expedition of the American Geographical Society. Some of them will be dropped with supplies by parachute in wilderness areas which the ground crew may not reach for several weeks. In the meantime the sets may have to withstand rough handling by inquisitive bears.

THE bright star Arcturus, which passed almost directly overhead in June evenings, "is representative of a class of fairly numerous stars, known as K giants, which differ in many ways from the normal, or dwarf stars, like the sun," said Dr. Gustaf Stromberg, of the Mount Wilson Observatory, before a session of the Astronomical Society of the Pacific. They are rather large, having diameters from 10 to 50 times that of the sun and their intrinsic brightnesses are equivalent to from 50 to 500 suns. They are much redder than the sun and therefore have considerably cooler atmospheres. The mechanism by which they generate heat must be quite different from that activating the sun and other normal stars and their evolution may well have followed different lines. They are not in general found in star clusters in or outside the galactic system and seem to be peculiar to our own system, or even perhaps to that part of the system in which we are at the present time. They are quite distinct from the so-called supergiants, which are found in star clusters.