Alcoa

POSSIBLE SST MATERIAL—Large titanium forgings will soon be produced on this 50,000-ton press by Alcoa, Cleveland, Ohio. Titanium forgings will probably be used in areas subjected to elevated temperatures in the supersonic transport plane.

PHYSICS

Major Energy Cosmic?

New research indicates that cosmic radiation may fill all of space, not just our galaxy, and represent one of the major forms of energy in the universe.

➤ COSMIC RADIATION represents one of the major forms of energy in the universe if new research summarized in a communication to the American Physical Society by Prof. C. J. Waddington of the University of Minnesota is confirmed.

Satellite experiments by scientists at the University of Chicago and the National Aeronautics and Space Administration and high altitude balloon experiments by Minnesota scientists have shown that previous ideas on how long and how far these nuclei travel in interstellar space were probably incorrect.

It now appears that either these nuclei are younger and have passed through less of the Milky Way galaxy than previously thought to be the case, so that they represent a relatively local phenomenon, or that, alternatively, the cosmic radiation fills all of space, not just our galaxy.

If these atomic nuclei spend most of their time in intergalactic space, then the cosmic radiation will represent one of the major forms of energy in the universe.

If this is so, then the physical processes of producing cosmic rays must be as common as those which produce star light.

Space is filled with a tenuous gas of extremely energetic cosmic ray particles which are produced by some unknown mechanism in some unidentified sources, Dr. Waddington reported. These particles are made up of nuclei like those of the elements that are commonly found on the earth but are mostly traveling with velocities near that of light. The majority originate outside the solar system. They thus represent the only material available to us which has definitely originated somewhere in the universe other than in the solar system.

As the particles travel through interstellar space, they are affected in a number of ways by the fact that this space is not completely empty. Instead, it contains weak but extensive magnetic fields and small amounts of matter. Since the particles have an electric charge, these magnetic fields bend the paths of the particles into tight spirals. There appear to be essentially random variations in the directions of the magnetic fields, and as a result it is probable that the motion of the particles resembles that of a drunkard's walk. All clues to the original direction and hence location of the particular source is lost long before a particle is observed by people on earth. Indeed the particles appear to arrive in equal numbers from all directions.

The matter present in interstellar space occasionally causes the heavier nuclei to split into lighter particles, thus changing the overall numbers of nuclei of each type. Physicists can use this change to measure the amount of matter traversed. This matter also causes the particles to lose energy in a manner dependent upon the charge and thus changes the distribution of energy observed when they reach the earth.

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PHYSICS

Cooperative Phenomenon Alike for Atoms, People

➤ ATOMS, LIKE PEOPLE, act strangely when they are too close together. The behavior of an individual person or atom changes when he, she or it gets into a congested situation, said Dr. Bernd T. Matthias, director of the institute for the study of matter, University of California, San Diego, and a member of the technical staff of Bell Telephone Laboratories, New York.

The recent northeast blackout illustrates what happens when too many electrical particles converge and create a catastrophic surge of power, Dr. Matthias said at a meeting sponsored by the Council for the Advancement of Science Writing, La Jolla, Calif.

A human example of this particular occurrence, which Dr. Matthias called cooperative phenomenon, is the teeming behavior and unrest of some of the 20,000 students demonstrating for the Free Speech Movement at the University of California at Berkeley campus, compared with the relative calmness of the 2,000 on the San Diego campus.

Individual atoms or molecules also behave in unusual manners when congested or under different conditions of temperature. When atoms of certain metals line up in respect to their spinning electrons, their collective behavior produces ferromagnetism, the property of being highly magnetic.

Five metals exhibit this particular behavior: chromium, manganese, iron, cobalt and nickel.

There is no apparent reason why these metals become magnetic when atoms are arranged in a particular manner.

Another cooperative phenomenon is the melting point of metals, the point at which individual atoms suddenly behave in a manner to form a liquid. Every element except helium turns solid below minus 434..2 degrees F. and gaseous above 7,100 degrees F.

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CHEMISTRY

Alkaloid Synthesized Using Ultraviolet Light

➤ NATURE takes a century or more to produce little more than one gram of the alkaloid maculine.

Dr. Hans Zimmer, chemistry professor at the University of Cincinnati, has synthesized 20 grams of the rare alkaloid in about a month using ultraviolet light.

Maculine is an alkaloid found in the bark of certain Australian hardwoods. There is no practical use for maculine at present. Experiments in making it in the laboratory through a long, laborious process involving 17 steps were carried out by an English chemist in 1957. Dr. Zimmer's method refines the system to a simple, short three steps.

The systematic use of light in organic synthesis has a great future, in Dr. Zimmer's opinion. Light in the laboratory can simplify and shorten the process of synthesizing organic compounds.

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