SCIENCE NEWS

Science Service, Washington, D. C.

SLIP PLANES OF ALLOYS

THE bending or distortion of metals occurs because the planes of the atomic crystal groups slip over one another. The softer the metal the easier this slip occurs. To produce hard alloys what might be called "atomic sand" is put between the slip planes to stop the ease of slipping and hence make the metal harder. Thus, in summary, did Professor Robert F. Mehl, director of the Metals Research Laboratory of the Carnegie Institute of Technology, outline the behavior of metals in his Priestley Lecture at the Pennsylvania State College. The lecture is one of five on the subject "Reactions in Solid Alloys." The Priestley lectures are yearly given by some invited scientific man to honor the memory of Joseph Priestley, discoverer of oxygen, who came to Pennsylvania in 1794 after persecution in England. Priestley's influence on the progress of science in America was very great.

It is postulated, said Dr. Mehl, that among the chemical reactions which can occur in the solid metallic state is that of precipitation in which one metallic element in an alloy can, if conditions are right, precipitate out. To explain the growing hardness of some alloys with age it has been suggested—and generally accepted—that this precipitation can occur along the slip planes between atomic groups in the crystalline metal. This precipitate, in its way, acts like sand under the slipping wheels of a trolley car in that it stops the slip. For metals this decrease of slipping represents increased hardness.

It has been found that there is some optimum size of atomic precipitate which induces the greatest hardness. If the metal is heated these little bits of "atomic sand" grow in size and eventually grow so large that they are too big to prevent slip effectively. Thus, one can increase the annealing temperature of metals by steps and find some temperature which produces the maximum of hardness in the metal. Below and above this point of annealing temperature softer metals will result than at the temperature where the maximum hardness is produced. Dr. Paul Dyer Merica, of the International Nickel Company, developed this precipitation hardening theory while at the National Bureau of Standards in Washington.

A SYMPOSIUM ON SOLUTIONS

MAN has been using sugar in his tea and salt in his porridge for many, many years as flavoring and seasoning. But if you set out, as have so many of the world's greatest chemists, to seek the explanation of what happens to the dissolved sugar or salt, you will find yourself on the trail of one of the toughest problems of science; the study of solutions and their many properties.

Those speaking at the symposium on "Ions in Solution," held at the Franklin Institute, were Dr. Herbert S. Harned, professor of chemistry, Yale University; Dr. Duncan A. MacInnes, Rockefeller Institute for Medical Research; Dr. Charles A. Kraus, professor and director of chemical research, Brown University, and president-elect of the American Chemical Society, and Dr. Victor K. La Mer, professor of chemistry, Columbia University.

Dr. MacInnes described the behavior of substances in aqueous solution for his research organization is primarily interested in studying problems of the human body. And water is the solvent widely used by the body of man. Dr. Kraus discussed the behavior of substances in solvents other than water because theoretically and even industrially water is not, perhaps, the best solvent which can be used in many cases. Dr. Harned described the relation of the laws of heat and thermodynamics to a study of solutions, for one of the ways to study solutions accurately is to check their boiling points, their freezing points and many other matters bound up intimately with the laws governing the interchanges of heat and energy which is the concern of thermodynamics. Dr. La Mer, final speaker on the symposium, described the motions of those carriers of electricity, the ions, which move about —or "swim," as it is sometimes said—freely in some solutions. It is the ions of various atoms which make atoms of silver rush across a solution and deposit as silver-plating on silverware. And it is the ions, also, which transport the electricity inside the battery of the car; electricity which goes along wires to the starting motor and spins the heavy, powerful engine beneath the hood.

METEORITES

EXPLODING atoms of radium, giving off helium, lead and energy, now tell the ages of many meteorites which wandered into the earth's gravitational field, later crashing to earth with fiery brilliance.

Some of them, according to figures recently published by Dr. Wm. D. Urry, physical chemist of the Massachusetts Institute of Technology, who has been analyzing rocks for many years to determine their ages, are less than 100,000,000 years old, while others are as much as 2,800,000,000 years old—about as old as the solar system. Dr. Urry's analyses, painstakingly made from samples of the meteorite, tell the age of its solidification, and not the time when it fell. Thus, some meteorites were molten during the age of dinosaurs on earth, while others solidified just as the solar system was being formed.

The oldest meteorites, according to Dr. Urry's figures, could truly be "chips from creation," left over from the great mass of material pulled from the sun when the planets were formed. Others, unless they stayed melted for more than two billion years in the bitter cold of space, could not be left-overs. They must have been formed some other way. Until recently, it was believed that meteorites were remains of a small planet, or group of planets, whose orbits were beyond Mars. This planet, on breaking up, created the meteorites. Now, with the ages of the meteorites shown to be different, the theory of a disrupted planet may need to be revised.

Many of the stony meteorites show evidence of having been broken and recemented, while others have undergone

other alterations just as a rock on earth might in the course of its history. All the rocks, however, are of the primary type—they were melted once, but none of them resemble earthly sediments, such as sandstone or shale. The iron meteorites resemble the earth's interior as it has been described by geophysicists, whose instruments tell them facts about places they will never see.

Comets, when they cool and compact into large masses from clouds of luminous dust, are the source of meteorites, according to another theory. Some geologists believe that meteorites do not come from the solar system at all, but that they are wanderers from outer space, attracted into the solar system by the sun's pull, and only incidentally pulled to earth. The new figures do not solve the riddle of the meteorites, but only show that they are of widely differing ages.

AIRPLANE MATERIALS

THE modern airplane may symbolize man's adoption of the light metal alloys like aluminum and magnesium, but old time-tried steel is by no means outmoded for aerial transport. Over 17 per cent. of the basic weight of a large modern transport (the plane with engine, propellers, starters and all accessories) consists of steel, according to J. Richard Goldstein, of the Douglas Aircraft Company, at a meeting of the Western Metals Congress, which was recently held in Los Angeles. On a big 21-passenger transport the total steel now used weighs about a ton in all. This steel appears in 24 different kinds of alloys. If airplane designers considered only strength of materials for their given weights there would be little to choose between wood, aluminum alloys, magnesium alloys and steels. The strength-weight ratios of these four common structural materials are so nearly equal that most fair-minded authorities admit intelligent design with any of the materials can result in a structure of very nearly the same efficiency. The difference becomes more important when one considers such items as the number of units to be built, their size, and the type of service for which the plane is intended.

America's supplies of magnesium are practically inexhaustible, said A. W. Winston, of the Dow Chemical Company, Midland, Mich., on the same program. They exist as magnesium chloride or as magnesium carbonate in dolomitic limestone and magnesite. It is the magnesium chloride found in the salt brines from wells in central Michigan which provides the nation's major source today. Landing wheels and engine parts are the principal American applications of magnesium alloys in airplanes. Landing wheels on the largest airplanes, if made of magnesium alloys, would mean a weight saving of 150 pounds, or the weight of another passenger. Thus at present air travel fares a plane with such wheels could theoretically save $149.95 for each New York to Los Angeles trip. Admitting that all of this saving could not be realized, Mr. Winston added, the opportunity still exists for increased payloads through weight reduction by the use of light-weight alloys. In Europe magnesium alloy propellers have been used for some time and in the 1934 European Air Derby 26 of the 34 entries had such propellers, including the first six planes to finish. Germany, which has pioneered in the use of magnesium alloys for airplanes because of its lack of aluminum resources, produced the great 12-engined flying boat, the *DO–X*, which had its main spars of magnesium alloy. This giant airplane—ten years ahead of its time as far as size—successfully flew the Atlantic.

BRAIN WAVES AND THE DIAGNOSIS OF TUMORS

THE brain's electrical waves are being used to diagnose the presence of cerebral lesions such as tumors and scars by Dr. Theodore J. Case, neurophysiologist of the University of Chicago. Eleven cases have shown that a diagnostic procedure has been perfected that uses brain waves just as the electrocardiograph is used in diagnosing heart disease. Dr. Case, in reporting to the Chicago Neurological Society, pointed out that the brain wave method could not yet be used as the sole guide for the physician in his diagnosis and had to be used in conjunction with other means such as x-rays or drilling a hole into the skull.

Dr. Case said his technique had important advantages of not causing the patient any pain or discomfort and of detecting lesions in the so-called silent areas of the brain. These lesions can not be detected by neurological symptoms as are those in the motor areas. Research workers have known for some time that the brain's nerve cells pulsed electrically at a regular cadence all the time and they perfected methods for amplifying these pulsations and recording them. Normal brains show frequencies between eight and forty waves per second, the most common being the ten per second alpha wave.

In the cases reported by Dr. Case and verified either by operation or autopsy it was found that lesions are denoted by localized regular waves with a frequency of one to three per second, by very slow waves varying from one in five to one in two seconds, and by irregular spike or sawtooth waves. The most common indication of a lesion was the localized regular wave with a frequency of one to three per second. The abnormal waves were localized with respect to the lesion which could be closely defined by shifting the electrodes until the characteristic waves were strongest. The research was supported by a grant from the Otho S. A. Sprague Memorial Institute.

THE PREVENTION OF LEPROSY

A DEFINITE plan for conquering leprosy by eradicating it from future generations was presented by Dr. H. E. Hasseltine, medical director of the U. S. Public Health Service in charge of the National Leprosarium at Carville, La., at the International Leprosy Conference which opened recently at Cairo, Egypt.

Dr. Hasseltine's plan is to establish a Preventorium, in the vicinity of the National Leprosarium, to which children of leprous parents may be admitted, cared for and educated at government expense until they reach their majority. Such a plan, Dr. Hasseltine believes, would go a long way toward conquering leprosy, in the United States at least, because it would prevent its development in future generations. Nothing like a specific remedy has yet been discovered for this age-old

plague, so preventive measures must be used as far as possible. The Preventorium might not be practical in countries where there are large numbers of lepers, but he believes it would cut down the number of lepers in the United States in the future.

Leprosy in children can generally be traced to infection from a leprous parent or other relative, such as a grandparent. This is probably not a matter of inheritance but of infection by contact. When a child is taken from its leprous parent at birth, it may escape the disease. This much Dr. Hasseltine has learned from his long study of leprosy both in the United States and Hawaii, although he points out that much is still unknown about how leprosy is transmitted. The mystery is a hard one to pierce because apparently many years may elapse between the time when a person, often unknowingly, picks up the germ of leprosy and the time symptoms of the disease first appear. By putting children of lepers in a Preventorium, Dr. Hasseltine points out, many cases can be prevented, those that do develop will be detected early when treatment is of most benefit, and the children will in general be better fed, housed and clothed than in their poverty-stricken homes. The cost for maintaining and caring for these children would be no more than for maintaining and caring for an equal number of lepers, and spending the money on the children of lepers may cut down the future number of lepers, thus proving an economy in the end.—JANE STAFFORD.

USEFUL EMPLOYMENT AS A HEALTH MEASURE

USEFUL employment—with emphasis on the useful—for all who are able and willing to work was urged as a public health measure by Surgeon-General Thomas Parran, of the U. S. Public Health Service. Speaking "as a doctor" before a Senate committee to investigate unemployment and relief, Dr. Parran said: "Whatever the cost, I would urge that from the standpoint of public health, in its larger concept—of mental health—economic factors are subordinate to the vital necessity of providing for our destitute citizens an opportunity of a livelihood earned by individual effort. We can not for long years and perhaps generations repair losses to human character and mental health which will result from a failure to give useful employment to our citizens. The vicious circle of poverty-disease-poverty can best be broken, Dr. Parran said, "by doing what we know how to do to improve the health of the underprivileged groups."

He cited figures from the recent Public Health Service survey showing that there is much more illness among the unemployed and much less medical care than among those in more comfortable economic circumstances, and that disease is a larger factor in unemployment and unemployability. Unemployment and economic worry were among the factors causing mental illness and breakdown in as high as one fourth of first admissions to mental disease hospitals during depression years, according to hospital superintendents' estimates. Illness and death due to tuberculosis, syphilis, pneumonia and cancer could be greatly reduced by applying present knowledge to all classes of the population. Death rates from tuberculosis among the unemployed are now as high as they were for the entire population in 1900. The reduction in the general tuberculosis death rate during the years since 1900 hides the high death rate among lower economic groups.

ITEMS

VANADIUM, hard-to-get steel-alloying metal, usually mined at high labor cost and other expense in out-of-the-way desert and jungle regions, is now being produced at the rate of 200,000 pounds annually from the flue deposits of steamships burning Venezuelan oil, according to a report by Jerome Strauss, vice-president of the Vanadium Corporation of America, producer and importer of this rare metal. Vanadium occurs in very small and quite variable amounts in almost all crude petroleum, but only the Venezuelan and Mexican oils provide enough vanadium to be of commercial value. In recent years, this vanadium-bearing petroleum has been burned by steamships, and the non-inflammable vanadium oxide left behind with the soot and coke, from which it is recovered when the burners of the steamships are cleaned. Occurring in concentrations of from 5 to 25 per cent., in these soots and cokes the vanadium oxide is extracted in the United States, Japan and England.

No commercial oil wells are likely to be drilled on the Atlantic Coastal plain, according to a report made by Miss Olive C. Postley, of the U. S. Geological Survey, to the American Association of Petroleum Geologists, because the oil-barren basement rocks are too close to the surface, often being encountered at depths of less than 1,000 feet. More drilling will be necessary in Georgia and southern Florida before any statement about oil reserves there can be made. In these areas, few deep wells have been drilled, and the underlying rocks are largely unknown.

THE carcass of a mammoth, recently found whole and frozen in the icy soil of Wrangel Island, is to be removed to Moscow by a special expedition of the Academy of Sciences of the U.S.S.R., according to a report by Tass. The expedition will move in three parties. The first group, consisting of three scientists, left Irkutsk by air for Wrangel Island in the beginning of March. They mounted guard over the carcass and began the excavation and exploration of the island. The second group will sail in May or June from Vladivostok to the estuary of the Anadyr or Providence Bay and from there will reach the island by air. In this party, an expert on permanently frozen soil and a zoologist participating in the expedition will make investigations. The third group will sail from Vladivostok in a steamer specially equipped for transferring the carcass. It is expected that the ship will reach the island in August. The carcass will be brought to Vladivostok and stored in a refrigerator. Because of its large size it will probably prove impossible to carry the whole carcass in a railway car to Moscow. In this case the mammoth will be dissected in Vladivostok.