

ASTROPHYSICS

Mutual Aid in Space

United States space goals are being advanced by a "mutual aid" research program, an experiment in international cooperation, launched by NASA, Lillian Levy reports.

► FUTURE UNITED STATES satellites and rockets streaking through space will be products of the skill and knowledge of scientists from many nations.

The high-flying vehicles will offer dramatic proof of the success of an experimental "mutual aid" research program launched by the National Aeronautics and Space Administration. This is the unique "research associateships" project of Goddard Space Flight Center theoretical division, NASA's major "think" plant.

Under this program several distinguished foreign scientists have contributed to NASA's highly complex and original space research.

They are among the "research associates" recipients of special NASA fellowships for scientists of postdoctoral rank, who work in the theoretical division under the direction of Dr. Robert Jastrow, 35-year-old specialist in physics of the upper atmosphere.

The appointments are available to U. S. scientists as well as those from abroad, but the majority have been given to foreign scientists. The associates represent a variety of countries: Japan, Italy, Denmark, China, India, New Zealand, Great Britain, Germany, and the United States. They represent, as well, a variety of scientific disciplines, astrophysics, ionosphere physics, seismology, and cosmic radiation.

Designing Space Experiments

This is in keeping with the character of the division which includes geophysicists, astronomers, celestial mechanics and physicists working "for the first time as a team in space research," Dr. Jastrow told SCIENCE SERVICE.

The division is responsible for designing space experiments aimed at unlocking the secrets of the universe and revealing its origin. Experiments and research are concerned with the structure of the earth, the composition of the atmosphere of the earth and of other planets, the role of the moon and other bodies in the solar system, and the evolution and structure of the stars.

The "aid" provided by the associateship appointments to this broad research has been substantial. "The program has made as great a contribution as any other single element toward the success of the theoretical division," Dr. Jastrow said.

A major contribution, for example, was made by Dr. Bengt Stromgren, senior research associate from Denmark, who initiated special research in theoretical astrophysics. Now at the Institute for Advanced Study at Princeton, Dr. Stromgren undertook a study with division scientists on convective zones in stars that have a mass about the same as the sun. The zones occur at certain levels within the stars where

energy is transferred by mass movements, as when steam rises from a boiling kettle, rather than by direct radiation.

Associate Dr. Hong-Yee Chiu of the Republic of China, an exceptionally talented theorist, did astrophysical research on supernovae, the exploding stars believed to represent the final stages of stellar evolution. Stars are believed born of stellar dust and supernova stars ultimately in explosion return to dust.

The calculations of Dr. C. Hayashi of Japan on the evolution of more massive stars "will improve our measurements of the ages of the stars," Dr. Jastrow said. This special research on stars by the associates is an important part of the search for the answers to how the world began.

Dr. N. Fukushima, Japanese physicist, is making a valuable contribution by the collection and analysis of geomagnetic data and their cross correlation to latitude and longitude dependence of geomagnetic effects.

Dr. Norman F. Ness, a U. S. associate from the University of California, Los Angeles, is involved in the analysis of magnetometer data. Such analysis will provide more accurate mapping of the magnitude and direction of the earth's magnetic field. This, combined with the research by Dr. Fukushima, will help pinpoint exact sources of energies in solar terrestrial relationships.

Dr. Ness has a "down-to-earth" approach

to space research. His analysis of seismic data of the Chilean quake of May 22, 1960, and the identification of periods of free vibrations of the earth from these data has yielded important information on the earth's inner structure. These studies have important implications in space, since seismic measurements of the moon made from a future lunar space probe may be compared with these to determine accurately the internal structure of the moon.

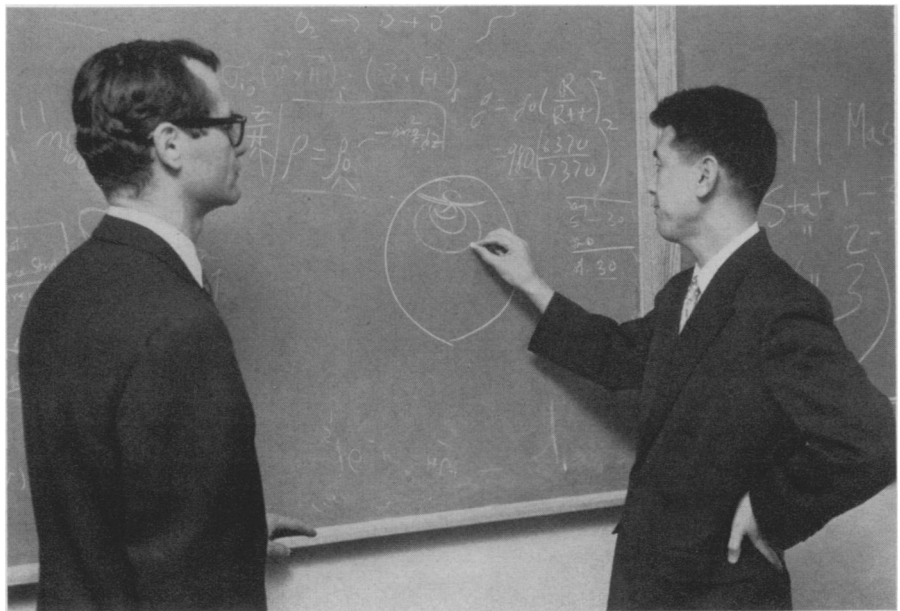
Dr. Harold C. Urey, Nobelist and senior associate at the University of California, La Jolla, has suggested that the moon's surface holds cosmic matter that may reveal the story of how the earth and the solar system were formed. Dr. Urey's ideas are credited with having profoundly affected the thinking of the division on the importance of lunar exploration.

Develops View of Aurora

Dr. Daniele D. Cattani, research associate from Italy, has developed a very interesting view of aurora (northern lights) in terms of electric discharge phenomena that possibly would involve the Van Allen radiation belts, and may bring new light to solar-earth relationships.

Participation in the NASA program thus far has been only by scientists from Western-bloc nations. However, at the request of President John F. Kennedy, a study has been made to determine areas in which the U. S. and the USSR may join in exploration of space for peaceful uses and benefit.

Meanwhile, NASA intends to continue to promote international programs in space



SPACE WISE MEN.—Dr. Robert Jastrow, chief of NASA's theoretical division, checks with "research associate" Dr. N. Fukushima of Japan on calculations of geomagnetic data.

for all nations eager to share in the pioneering efforts in this vast new frontier.

In addition to the international cooperation through its program of research associateships, NASA has provided technological assistance to the rocket and satellite programs in England, France, Japan, Norway, Sweden, Argentina, Italy and Canada.

In fact, one Canadian program utilizes the facilities of the common launching site at Ft. Churchill, where one-third of NASA's own sounding rockets are launched.

Sounding rockets are used to take readings in the earth's atmosphere that may yield information about weather. Frequently, such scientific rockets are launched into the ionosphere to obtain readings that will increase knowledge related to communication.

Italy successfully launched its first sounding rocket in Sardinia in January, 1961, a project which NASA fostered.

Currently, the United States and the United Kingdom are working on a joint satellite project.

Many of the nations receiving technical and material help from NASA have reciprocated by being hosts to NASA's tracking and communications stations overseas. Almost a dozen countries have these stations, many of which are operated by technicians of the host countries. In some

instances, the operating costs are defrayed by the country. NASA also has made many of the stations available for scientific use by the country in which they are located as operating schedules permit.

Recent participation of many countries in weather observations synchronized with Tiros II was of practical benefit, particularly to the Australian Weather Service. By means of information from Tiros and its own observers, it was able to forecast and prepare for weather in advance, with considerable financial benefit.

Reciprocity or "mutual aid" is essential to the health of any cooperative effort, whether it be in outer space or in health, education and welfare. The amount of aid that may be exchanged is not as significant as the willingness to share.

Currently, the Administration is attempting to promote reciprocal exchange agreements in space with the Soviet Union "that will contribute to some useful purpose."

President John F. Kennedy has pledged that "we are going to continue to attempt to engage the Soviet Union in a common effort of that kind of (useful space) activity."

Such an agreement will satisfy a major goal of NASA—that space be utilized by all men for the common good.

• Science News Letter, 79:218 April 8, 1961

MEDICINE

Muscular Dystrophy Test

► MUSCULAR DYSTROPHY can now be detected long before the physical symptoms have appeared by an increase in enzymes in a person's blood serum.

The new test makes it possible to trace development of muscular dystrophy for the first time from its very early stages. It was reported from the University of California, Los Angeles Medical School by Dr. Carl M. Pearson in collaboration with Drs. S. R. Chowdhury, W. M. Fowler and W. H. Griffith.

"Since there is no known cure for the disease, early detection will not help us to treat the disease any better," Dr. Pearson noted. "But this broadening, step-by-step concept of the disorder may eventually lead to improved methods of treatment and even prevention of it."

In studies of families with a history of muscular dystrophy, elevation of serum enzymes was detected in a number of normal appearing children under three years of age. The youngest was only four months old.

Studies of biopsied muscle tissue revealed that changes in muscle of these children had already occurred although physical symptoms had not as yet appeared. Physical symptoms of muscular weakness have since appeared in some of the children.

These studies have suggested the following steps in development of the disorder: 1. occurrence of a biochemical defect in muscle cells, probably genetic in origin; 2. increased permeability of muscle-cell membrane, causing enzymes to leak out of muscle tissue and into the blood; 3. accumulation of excess biochemical products, leading to early breakdown of muscle; 4. regeneration of muscle fibers which is quan-

titatively insufficient to keep up with breakdown process; 5. replacement of damaged areas by fat and connective tissue; 6. appearance of clinical muscular weakness (the stage when the disorder is usually diagnosed and biopsied); and 7. advanced muscular weakness.

The disease may in some cases actually begin in the prenatal period, Dr. Pearson said.

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GENERAL SCIENCE

U. S. Research Boon To Economic Growth

► UNITED STATES research and development is one of the most effective spurs to continual economic growth, statistics reported by the National Science Foundation, Washington, D. C., show.

About \$12.4 billion was spent on research and development in 1959, which accounted for 2.6% of the gross national product (GNP). During the past few years, this ratio has continually stayed above 2%, the Foundation reported.

New products absorbed into the economy continually stimulate U. S. investment and output. Such products as transistors show that certain research and development efforts result in much greater returns than in investments for plants and equipment. In 1959, funds for research and development represented about one-tenth of the total U.S. investment.

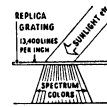
The report is available from the U. S. Government Printing Office, Washington 25, D. C., for ten cents.

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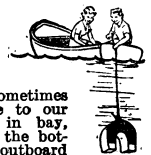
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