INTERNATIONAL

Cooperation in Space Research

In recent years, national space agencies have been established in countries throughout the world, and there has been a steady increase in the number of enterprises involving international collaboration in conducting experimental research programs in the upper atmosphere and outer space. The United States has participated directly in most of these programs in keeping with the intent of the basic legislation under which the National Aeronautics and Space Administration was created—namely, that the aeronautical and space activities of the United States "shall be conducted so as to contribute materially" to cooperation with other nations and groups of nations in the peaceful application of space research. In addition to participating fully in the work of COSPAR, the interunion Committee on Space Research of the International Council of Scientific Unions, the United States has cooperated with the United Nations and its specialized agencies and has endorsed bilateral arrangements between NASA and counterpart agencies in other countries.

To date, NASA has entered into cooperative agreements with nearly sixty different nations to carry out over one hundred separate projects, including those involving sounding rockets, deep-space probes, the cooperative launching of satellites, and ground-based programs in connection with meteorological and communication experiments. Two months ago, on December 5, 1962, NASA's program of bilateral cooperation with other nations gained new dimensions with the simultaneous announcement by the United States and the Soviet Union of a bilateral arrangement for collaboration between the two nations in the peaceful exploration and use of outer space.

The US-USSR program is mapped out in a "summary of understandings" which was signed last June in Geneva by Hugh L. Dryden, deputy director of NASA, and by A. A. Blagonravov of the Soviet Academy of Sciences. The agreement calls for the cooperation of the two nations (1) toward establishment of a global weather satellite system for the benefit of other nations, (2) on the compilation of a map of the earth's magnetic field using satellites for the further exploration of space and the advancement of the science of earth magnetism, and (3) on a passive communications experiment with Echo II.

The program in meteorology calls for establishing communication links for the exchange of satellite weather data gathered by each nation from its own experimental meteorological satellites, ". . . with the understanding that such transfers will include selected cloud-cover pictures, especially related to storms, vortices, fronts, and the generation of these phenomena, with geographic coordinates provided for all pictures selected, together with nephanalyses based upon the data as a whole. . . . The same communication links would be used to exchange weather charts, diagrams, vertical cross sections, and the material required for solving the problems of world weather, including the extension of the prediction period." A second phase of the program calls for the coordinated launchings within the next two years by the two nations of a system of operational weather satellites, again including provision for the full, mutual exchange of data.

The joint geomagnetic survey will involve the coordinated launching of two satellites (one by each nation) equipped with magnetometers, with mutual exchange of processed data of the resulting magnetic measurements. These launchings are to take place during the period of the International Year of the Quiet Sun (1964–65).

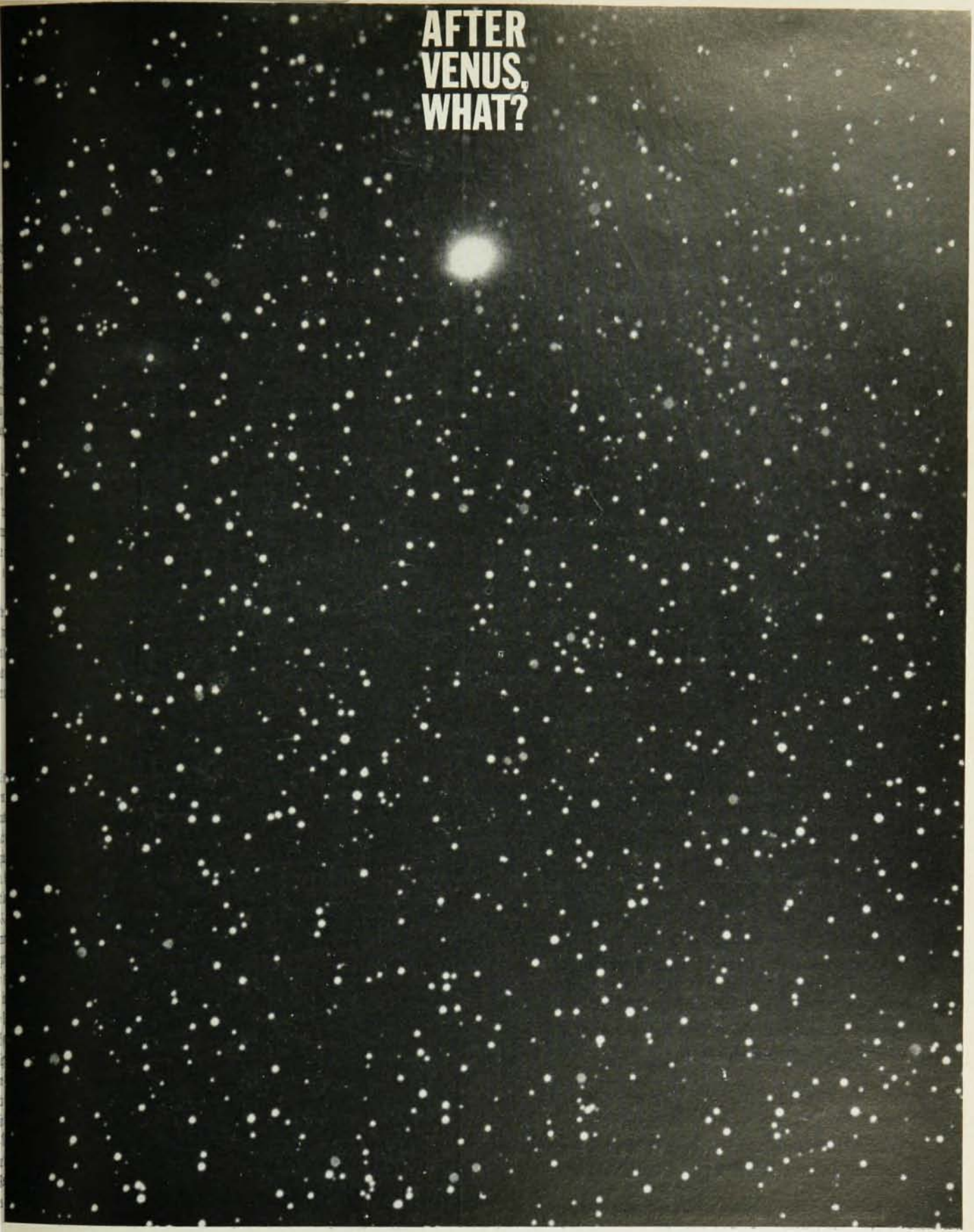
In addition to the agreement to cooperate in a passive satellite telecommunication study, the two nations have agreed to give further consideration to the possibilities of cooperation in joint experiments using active satellites that may be launched by either nation in the future.

The Naming of Satellites

On January 1, a change in the international system for designating satellites and space probes went into effect. Previously, satellites had been designated in order of the Greek alphabet, beginning anew each year; thus the first satellite of 1958 was 1958 Alpha, the second, 1958 Beta, and so forth. From now on, Arabic numerals will replace the Greek letters; the first launching of 1963 will be 1963-1, followed by 1963-2, etc. Since a single launching often places a number of objects in different orbits (one or more payloads plus the burned-out rocket casing), the new system also provides that the main component will be denoted by the suffix A, the next most important by B, and so on down to inert components. Under the old system, the navigation satellite, Transit II-A, its piggyback companion, Greb, and their spent rocket were designated 1960 Eta 1, 1960 Eta 2, and 1960 Eta 3, respectively. Had the new system then been in force, they would have been called 1960-7A, 1960-7B, and 1960-7C. The change was agreed upon last year by all national members of the Committee on Space Research of the International Council of Scientific Unions.

Traveler's Aid

Scientists planning trips to the Soviet Union or other countries of Eastern Europe and who want to find out



ıre we at JPL are elated with the success of our Mariner 2. ıt Venus is just one important way station on the long urney through space. There are lots more things to be done: Soft moon-landings. Landings on Mars. Jupiter fly-bys. ectronic probes of other planets. And more Venus trips.

Yes, there's much left to do out there. Much of it will ntinue to be done by the scientists and engineers at Caltech's Jet Propulsion Laboratory. They think for a living. If you do, think of yourself as part of JPL's exciting world of other-world exploration. A resume to JPL could make you a part of it.

JET PROPULSION LABORATORY
4810 Oak Grove Drive, Pasadena, California
Attention: Personnel Department

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more about the regions they will visit may find it useful to contact the Information Center for American Travelers to the Soviet Union, a division of the Governmental Affairs Institute. The Center, which is located at 345 East 46 Street, New York 17, N.Y., offers brief orientation programs for individuals or groups en route to the USSR and Eastern Europe; it will also send on request a brochure of pertinent data and will answer specific questions.

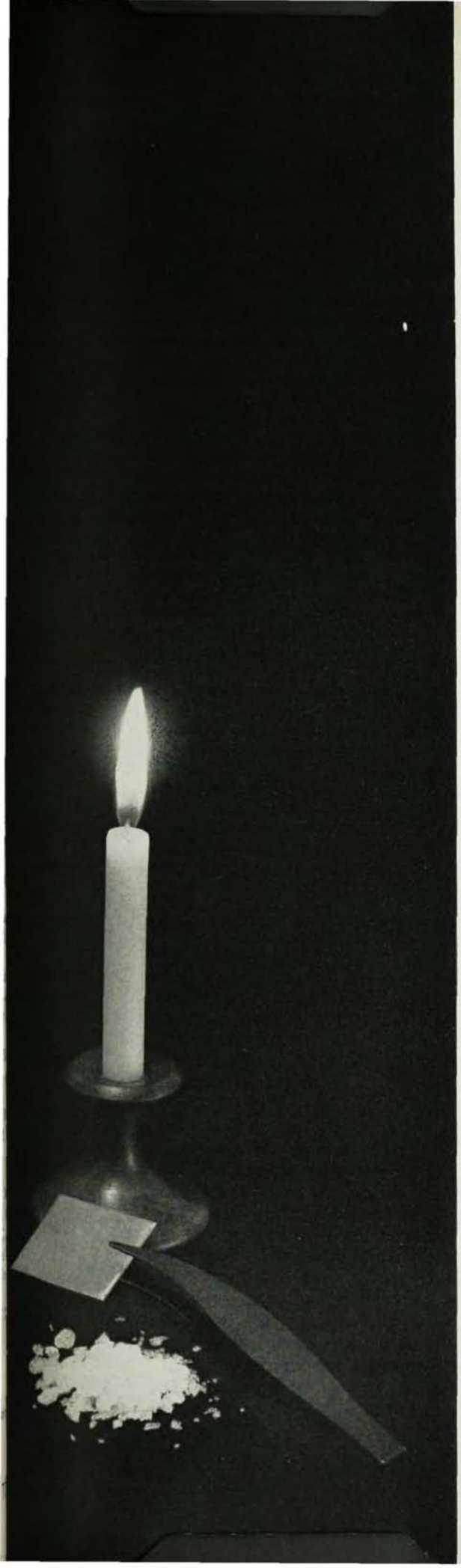
Another source of information for travelers heading east is the Office of the Foreign Secretary of the National Academy of Sciences, 2101 Constitution Avenue, Washington 25, D.C., which makes available copies of reports written by American scientists concerning their trips to the Soviet Union and Eastern Europe. Requests for further information about particular areas of interest are referred to individuals who are familiar with the region to be visited. The following specific material is listed by the NAS office as being available for the information of American scientists who are planning such trips:

Soviet Union

1. Lists of Soviet scientists and institutes visited by Americans in the fields of Astronomy, Chemical Sciences, Computers, Earth Sciences, Engineering, Mathematics, Medical Sciences, Physical Sciences; with attachments giving the names, addresses, and titles of reports of the American visitors.
2. *A Guide to the Soviet Academies* (organization and membership of All-Union and Republic academies), 104 pp.
3. *The Soviet Academy of Sciences* by Alexander Vucinich, series E: Institutions, No. 3, January 1956, published by the Stanford University Press, 157 pp.
4. "List of Russian Scientific Journals Available in English," August 1961, National Science Foundation, 39 pp.
5. "Providing U. S. Scientists With Soviet Scientific Information," prepared by Boris I. Gorokhoff, April 1962, National Science Foundation, 46 pp.
6. "Soviet Science and American Society" by Mark G. Field, reprinted from the *Journal of International Affairs*, Vol. XIII, No. 1, published by Associates for International Research, Inc., 16 pp.
7. "Soviet Science: The Institutional Debate" by Nicholas DeWitt, reprinted from the *Bulletin of the Atomic Scientists*, Vol. XVI, No. 6, June 1960, 4 pp.
8. "If You're Going to Russia" by Secor D. Browne, reprinted from *The Technology Review*, Vol. 61, No. 7, May 1959, 4 pp.
9. "So You're Going to Russia!" 28 pp.
10. "Soviet Russia—A Guidebook for Tourists" by Dean B. Mahin and Richard M. Scammon, published by the Governmental Affairs Institute, Washington, D.C., 68 pp.
11. *Facts on Travel in the Soviet Union*, published by the Institute for International Youth Affairs, Inc., New York, 1961, 36 pp.
12. "Guide to Streets and Locations in Moscow," 72 pp.
13. Map of Leningrad
14. Map of Moscow

Bulgaria

1. The Bulgarian Academy of Sciences (History and Organization)



One of a series briefly describing GM's research in depth

Breakthrough in Ferroelectrics

The spirit of science is tentative, experimental, skeptical. Thus we have been cautioned by our research colleagues here at the Laboratories of the naiveté of pinning a "breakthrough" label on a discovery they made in ferroelectric materials. We're not convinced.

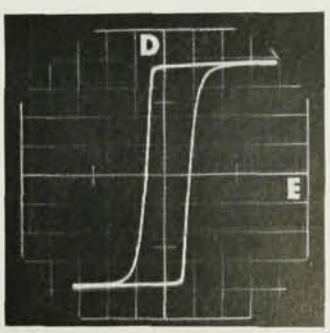
Ferroelectrics have remained on the scientist's workshelf as curious crystal analogs of ferromagnetic materials . . . as intriguing insulators whose dielectric "constant" isn't, but varies with changes in electric field intensity much in the hysteresis loop fashion of magnetic materials.

Recently, two members of our research staff reported they had observed ferroelectric behavior *at room temperature* in a polycrystalline form of ordinary saltpeter. Furthermore, this ferroelectric phase in potassium nitrate has nearly ideal electrical characteristics. Apparent true coercivity. Dielectric hysteresis loops that are really square (ratios of 600:1 and more). Here then is an inexpensive, easily prepared material that may perform the much sought after memory and switching functions in capacitive circuits—functions similar to those handled by their ferromagnetic brethren in inductive circuits.

This discovery is expected to stimulate the development of practical, compact electronic devices of interest to the computer, control, and communication sciences.
It is only one of the avenues of science and engineering being opened by GM's research in depth.

General Motors Research Laboratories

Warren, Michigan



Room temperature 60-cps hysteresis loop (above) of KNO_3 melted on copper substrate with the simplest of tools (left).

2. The Bulgarian Academy of Sciences (Institutes and Principal Officers)

Czechoslovakia

1. The Czechoslovak Academy of Sciences (History and Organization)
2. The Czechoslovak Academy of Sciences (Institutes and Principal Officers)
3. The Slovak Academy of Sciences (History and Organization)
4. The Slovak Academy of Sciences (Institutes and Principal Officers)
5. *Facts on Travel in Czechoslovakia,* published by the Institute for International Youth Affairs, Inc., New York, 1962. 36 pp.

Hungary

1. The Hungarian Academy of Sciences (History and Organization)
2. The Hungarian Academy of Sciences (Institutes and Principal Officers)
3. *Facts on Travel in Hungary,* published by the Institute for International Youth Affairs, Inc., New York, 1962. 36 pp.

Poland

1. The Polish Academy of Sciences (History and Organization)
2. The Polish Academy of Sciences (Institutes and Principal Officers)

Rumania

1. The Rumanian Academy of Sciences (History and Organization)
2. The Rumanian Academy of Sciences (Institutes and Principal Officers)

Yugoslavia

1. The Yugoslav Academies of Sciences (History and Organization)
2. Serbian Academy of Sciences (Institutes and Principal Officers)

Nuclear Institute in Brazil

A new Brazilian center of education and training is in the process of being organized as a joint enterprise of the University of Brazil and Brazil's Nuclear Energy Commission. To be known as the Institute of Nuclear Engineering, the school will be located on the Atlantic coast, a few miles south of Copacabana, and will be staffed with technical personnel from the principal educational centers in Rio de Janeiro. Although the Institute will be under the broad supervision of the Nuclear Energy Commission, it will be guided by a Technical and Scientific Council of five members, including representatives of the University of Brazil and the National School of Engineering.

An Argonaut-type reactor, of Brazilian construction and with enriched uranium fuel from the US, will be installed by the Nuclear Energy Commission. The Commission will also provide the additional equipment and accessories to establish and maintain the training and research program.