day, and where the introduction of the cooker is undertaken by persons familiar with the psychology of the people. First attempts to introduce solar cookers to villagers in less developed areas failed, largely because of the neglect of sociological factors.

The report mentions an experimental sun kitchen that was tested by the Heliolaboratory of the U.S.S.R. Academy of Sciences. It is estimated that such a kitchen, operating 250 days a year in sunny regions of the U.S.S.R., could save approximately 1000 kilowatt-hours of electrical energy.

Experimentation is also being carried on in several countries (such as Canada, Japan, and South Africa) in space heating and cooling. A number of solar-heated houses have been built in the United States. Investigations into solar air conditioning have also been carried out in a number of countries, and the U.S. has developed solar-energy cooling systems for livestock shelters.

Research into solar refrigeration has resulted in a solar refrigerator being devised in Israel, while in the U.S.S.R. and France ice-making machines based on absorption refrigeration have been constructed.

Experiments are also proceeding in a number of countries for applying solar heat for mechanical power and electricity. A helioboiler is being constructed in Israel, and Soviet scientists have drawn up plans for a large solar power installation to be erected in the Ararat Valley of Armenia.

As regards direct conversion to electricity, most of the progress so far achieved, it is reported, has been related to the discovery of new materials for use in generation by means of thermocouples and photovoltaic devices. The latter have been used in artificial satellites.

Of importance to arid regions are developments in the use of solar energy for production of fresh water. Several small units for distilling sea water or brackish water have recently been built in Australia, Italy, the African countries of the French community, and the United States. Larger pilot plants have been constructed in the United States and the U.S.S.R.

New methods of salt production by means of solar energy are being tried out in several countries and in some cases have been put to commercial use. The report mentions an economical and efficient method used in the Union of South Africa for separating common salt and Glauber's salt from natural brines. The use of solar reflectors to concentrate palm juice to produce unrefined sugar is reported from Burma and India.

Progress in using solar furnaces has been particularly rapid since 1956, says the report, and over 30 solar furnaces are operating throughout the world, most of them located in France, the United States, and the U.S.S.R. Solar furnaces are particularly useful as laboratory tools for research on fusion of rare metals, for the furnaces offer the unique advantage of complete purity in processing. They are also useful for testing metals for heat resistance—for examples, metals to be used in nuclear devices—and for small-scale mineral refining in remote locations.

Wind Power

The number of countries undertaking systematic research on wind power has been steadily increasing, the report states. Listed among these are: Israel, where a general wind survey has been completed and two small wind-driven electric generators have been installed; Spain, where surveys have been made with a view of using windmills for water pumping and for the desalinization of brackish waters; India, where testing stations have been set up to determine the potentialities of wind-driven plants for pumping water and generating electricity; Uruguay, where a survey of some 10 to 12 selected wind-power sites has been initiated; Burma, where studies on possible uses of wind-power are being made; and Pakistan, where wind measurements are being made to find favorable sites for water-pumping windmills.

While designs for wind-driven generators vary in different parts of the world, there is general agreement on several points, says the report. The tendency is to employ conventional, propeller-type machines which drive a generator through some form of gearing and to use a tower of the height necessary to give adequate ground clearance.

Small wind-power units (under 10 kilowatts) are now mass-produced in several industrialized countries and are used for radio and television relay stations, small residential areas, isolated resorts, pumping plants, navigation lights, and fog signals. An example of these is a medium-scale, wind-driven power unit developed in the U.S.S.R. It has a 25-kilowatt capacity and is used to supply electricity to villages and collective farms. Wind-driven generators for use with electrical networks have been tried out in Denmark, Algeria, the Federal Republic of Germany, Holland, the United Kingdom, and the U.S.S.R.

Geothermic Energy

Considerable progress made during the last 2 years in several countries in exploring, developing, and utilizing geothermic energy is reported. Whereas 2 years ago only one country (Italy) had geothermic power plants, today two others (New Zealand and the U.S.S.R.) are producing electricity by this means, and others expect to inaugurate plants in the near future. Additional geothermic fields have been discovered in France, Burma, Kenya, and the United States (southern California).

A number of geothermic resources in Mexico, having been evaluated by a U.N. technical assistance expert, are now under active development. In the West Indies, again after preliminary evaluation by a U.N. technical assistance expert, exploration drilling was begun on the island of Santa Lucia. Geothermic energy has been found at two places in El Salvador.

Iceland's considerable geothermic resources, long used for space heating, will be used for the production of sea salt; this will reduce imports of salt required in the country's fishing industry. The possibility of producing heavy water by means of geothermic energy has also been investigated in Iceland.

The first geothermic power plant in the U.S.S.R. has begun operation on the Kamchatka Peninsula, while the first units of a 293,000-kilowatt program have been inaugurated in New Zealand. Facilities for the latter are at Wairakei, where the average well depth is 2,000 feet and where wet steam is discharged from the wells with high intensity.

Recent Events in Radiocarbon

There have been several events recently in the field of radiocarbon.

Radiocarbon Supplement Established

The *American Journal of Science* has announced the establishment of a *Radiocarbon Supplement,* to be devoted wholly or largely to publication of radiocarbon date lists from laboratories in various parts of the world. Richard Foster Flint and Edward S. Deevey, Jr., are the editors.

Volume 1 of the *Supplement* will appear in May. Thereafter, one volume will appear each year. The office of the *Supplement* is the same as that of the *American Journal of Science* (Box 1905A, Yale Station, New Haven, Conn.); however, the *Supplement* will be separated from the *American Journal* and will be sent to a separate subscription list. The price of the first volume is $2.50.

Radiocarbon Association Formed

Radiocarbon Dates Association, Inc., a nonprofit corporation, has opened headquarters at Andover, Mass., with the generous assistance of the Wenner-Gren Foundation and the National Science Foundation. The organization was formed after an ad hoc committee had studied methods for developing and distributing edge-punched cards bearing

radiocarbon dates and a description of the samples assayed. The committee decided that the new record cards should also include the laboratory, laboratory number, method employed, and major scientific field concerned. The committee's suggestions have been followed, and a basic coding has been provided so that initial sorting of the cards is easily accomplished. There is room for each subscriber to set up an extensive code to sort the cards for his own research.

A survey indicated considerable demand for the cards, but the cost of production, $250 for a set of 5000 cards, resulted in a limited number of subscriptions. However, revision of the original plans and the generosity of the commercial houses involved has made it possible to proceed. The corporation is distributing sets of about 1000 cards each to subscribers, and there is the possibility that another 3000 cards can be delivered by the end of 1960. The remaining 1000 will be sent out when they are published.

Because the project is barely solvent, it is not going to be possible to print a surplus of these cards for nonsubscriber sale. Any organization that is contemplating purchase should communicate with Frederick Johnson, Radiocarbon Dates Association, Inc., R. S. Peabody Foundation, Box 71, Andover, Mass.

Center for Carbon-14 Determination

The International Agency for ^{14}C Determination (measurements of primary production in the sea), has been established at Charlottenlund Slot, Charlottenlund, Denmark. The agency is organized on a nonprofit basis. E. Steeman Nielsen, who is adviser on plankton research to the Danish Institute for Fisheries and Marine Research, is honorary supervisor, and the daily work is directed by Vagn Hansen of the same institute. The facilities of the agency are available to all scientific institutions in the world.

Manufacture of the carbon-14 ampoules that are used in experiments for measuring primary production in the sea requires a well-equipped laboratory and a scientist familiar with radioactive tracer work. The same is true concerning the measurements of the radioactivity of the filters containing the samples to be studied. Whereas large oceanographic institutions ordinarily have such an expert at their disposal, this is not true for many other marine laboratories.

This problem was discussed during the Symposium on Measurements of Primary Production in the Sea held at Bergen, Norway, in 1957 by the International Council for the Exploration of the Sea. An ad hoc working committee was appointed to consider the methods for the measurement of primary production. Among its recommendations which were adopted unanimously by some 80 symposium participants, was a paragraph that read: "It is suggested that a central agency be established, for example at Charlottenlund under the direction of E. Steemann Nielsen, which would provide standardized ampoules of ^{14}C, counting of ^{14}C samples, and calculation of carbon assimilation rates." In 1958 UNESCO provided funds for establishing the agency, which is now operating in space provided by the Danish Institute for Fisheries and Marine Research at Charlottenlund.

Radiotelescope under Construction

A team of ten students, directed by John D. Kraus of Ohio State University, is constructing an unusual radiotelescope under a National Science Foundation grant of $166,000. Two earlier grants by the foundation for this work have totaled $106,650.

The design, engineering, and construction of the two 360-foot-long antennas are done for the most part by the students, who work part time during the school year and on a full-time basis in the summer. Three nonstudent technical assistants are also employed on the project.

The new instrument is designed to be used in mapping radio sources in the sky at minimum cost. The installation will consist of a fixed parabolic antenna 360 feet long and 70 feet high; a flat, tiltable reflector 360 feet long and 100 feet high; and associated radio receiving equipment. The telescope is expected to go into operation in 1960.

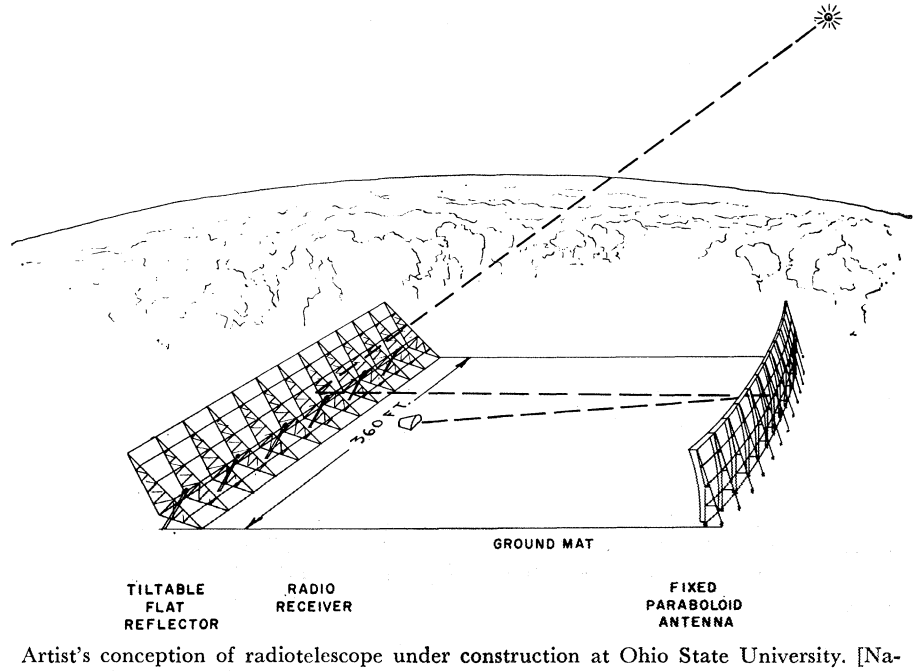
Soviet Science

Many reports, giving both accomplishments and proposals, have been published recently on Soviet scientific activities. Some of these are summarized here.

Two members of the United States Weather Bureau have reported that Soviet scientists have turned up evidence that a continental land mass lies below a great part of the ice-covered expanse of Antarctica. They said the "positive" evidence of a continent had been found by the Russians during a long, over-ice trek made in the latter part of 1958 from their main base at Mirny on the Knor Coast to the "pole of relative inaccessibility," a point about 1400 miles inland. During the trek the Soviet scientists made seismic soundings every 30 to 50 miles along the route. These indicated that the actual land mass started about 300 miles inland from the Mirny base camp.

Members of a group of astrophysicists which toured the Soviet Union last year reported that the U.S.S.R. is graduating about twice as many astronomers as the United States. They also gave their view that, although the United States now leads in astronomy, there is reason to believe that Russia may take the lead within 15 years.

Other scientific visitors to Russia report that Soviet mathematicians have made great progress in information theory and in cybernetics, two areas of mathematical study that were condemned on ideological grounds a few years ago. Work in the two fields is mostly theoretical because of the scarcity of large digital computers. Other observ-



Artist's conception of radiotelescope under construction at Ohio State University. [National Science Foundation]