submitting regular reports to Washington. Members of the Hawaii staff have been working all hours of the day and night on their special projects since the period of intense activity began. They meet early every morning for a conference, discuss their observations, determine what should be done next, establish a plan of action for the day, and then leave for the crater. Duties change from day to day as new objectives are indicated.

Increased heat radiation, strong gas emission, and smoke from burning trees are making the work difficult. However, unlike Kilauea's principal fire pit, which is lined by vertical walls, Kilauea Iki can be entered without too much difficulty. So far the eruptions have been confined to the crater, so that there is no danger yet to the surrounding area and buildings.

In addition to keeping continuous seismological and tiltmeter records, the staff members are performing certain tasks like lava collection and gas sampling on a regular basis. A series of gravity surveys is also being launched, and a network of gravimeter stations has just been established to study the changes in the force of gravity as the lava shifts underground.

Tentative Findings Reported

Early this month Murata reported that a rough correlation seems to exist between the olivine content and the temperature of the erupted material. The iron-magnesium mineral olivine apparently sinks rapidly in the magma so that a strong flushing action from deep down is required to bring it to the surface. It is during such periods of strong flow from depth that the highest temperatures can be expected.

During periods dominated by the formation of pumice, temperatures appear to be lower. There have been two periods of pumice eruption and two of picrite eruption; this suggests that the activity has a cycle pattern that is independent of the timing of the individual phases. (Picrite is a lava of high olivine content.)

Crater Rim Road, which is to leeward of the Kilauea Iki vent, is now buried under 100 feet of pumice, and more is accumulating. During the periods of pumice eruption, only a minor amount of lava runs from the vent and spreads slowly out over the chilled surface of the lava pond.

Murata has also reported that an analysis in mid-November of a sample of fresh lava showed it to be 49.5 percent silica, indicating, he said, that the magma was "definitely more primitive than anything that came out during the 1955 eruption." The primitive composition correlates with the rising temperatures measured. Jack Murata commented:

"This is a case of very rapid delivery of undifferentiated material to the surface. Our group had developed a concept of the effect of speed of ascent and cooling of the magma on the composition of the lavas, and this eruption seems to bear us out."

The long-range objective of the Hawaiian observatory's program is to learn enough about the geochemistry and geophysics of volcanos to be able to accurately predict eruptions, thus lessening destruction of human life and property. Since seismological tremors are continuing at Kilauea, termination of the present unusually interesting series of eruptions is not in sight.

Scientific Sections of Exchange Agreement with Soviet Union

On 21 November in Moscow the United States and the U.S.S.R. signed an agreement for cooperaton in exchanges in the scientific, technical, and cultural fields in 1960–61. The agreement included as an addendum the text of the Memorandum on Cooperation in the Field of the Utilization of Atomic Energy for Peaceful Purposes, which was signed in Washington, D.C., on 20 November [*Science* **130** *(4 Dec. 1959)*]. *Abstracts from the text of the new exchange program follow.*

Section II. Scientific Exchanges

1) The two parties, attaching great significance to the development of scientific exchanges between both countries, will take all appropriate measures in order to achieve fulfillment of the agreement for exchanges in the field of science concluded July 9, 1959, between the Academy of Sciences of the U.S.S.R. and the National Academy of Sciences of the U.S.A.

2) Additional visits by scientists of one country to the other country may also be agreed upon through diplomatic channels or between appropriate organizations as approved by each party.

Such visits, whether for the purpose of participating in scientific meetings, exchanges of experience, conducting studies, or delivering lectures shall take place on a basis of reciprocity.

3) Cooperation in the field of utilization of atomic energy for peaceful purposes. Both parties agree that in the field of the peaceful uses of atomic energy they will provide for reciprocal exchanges of information and visits of scientists and will explore the desirability of joint projects. To that end, specific proposals will be developed between the United States Atomic Energy Commission and the Main Administration for the Utilization of Atomic Energy under the Council of Ministers of the U.S.S.R. which will be subject to approval by the two governments in the usual manner, and which may be appended to this agreement as an addendum.

4) Both parties are in favor of having the Academy of Sciences of the U.S.S.R. and the American Council of Learned Societies come to an agreement on exchanges, on a reciprocal basis, of scholars in the social sciences and the humanities, such as historians, economists, philosophers, specialists in literature, and linguistics.

Both parties are in favor of having the Academy of Sciences of the U.S.S.R. and the American Council of Learned Societies provide for participation, on a reciprocal basis, by scholars of both countries in joint seminars and symposia and consider joint research projects.

5) Both parties agree to provide for an exchange of delegations of geographers of four to six persons for three to four weeks, with a program to be agreed upon by appropriate organizations. . . .

Section IV. Exchanges in the Field of Agriculture

1) Both parties will provide for an exchange of delegations of specialists in agriculture, consisting of three to six persons each, for a period of three to four weeks, in specific fields as follows:

Soviet Delegations to the U.S. (a) Food processing (meats, grains, and canning crops). (Number of persons in the delegation as previously agreed upon.) (b) Fertilizers, insecticides, and weed killers. (c) Poultry-husbandry, study of broiler production and methods of hybridization. (d) Agricultural science and information. (e) The breeding and hybridization of cattle and pigs. (f) Complex mechanization of cultivation and harvesting of sugar beets and potatoes.

U.S. Delegations to the U.S.S.R. (a)

Handling, storage, and transportation of grain. (b) Food processing. (c) Agricultural information and planning. (d) Soil salinity. (e) Poultry-husbandry. (f) Forage crops and range management.

2) Both parties will continue to exchange appropriate films dealing with the subject of agriculture.

Section V. Educational Exchanges

1) Both parties agree to provide for the exchange of students, postgraduate students, and young instructors or researchers between Soviet universities and other institutions of higher learning on the one hand and American universities and other institutions of higher learning on the other, of up to 35 persons on each side for the academic year 1960–61 and up to 50 persons for the academic year 1961–62. These exchanges will be carried out according to the annex to this section on the basis of appropriate subsequent agreement between the educational authorities of both parties, including the precise number of students and financial and other conditions. The educational authorities of each receiving side will undertake on the basis of reciprocity to place the students in scholarly institutions (including universities or other institutions of higher learning) appropriate to the specialty or scientific subject selected by them and to their scholarly attainments as required under paragraph 4 of the annex to this section.

2) The term "student" as used hereafter in this section of the agreement and in the annex shall be taken also to include postgraduate students and young instructors or researchers. Composition of student groups shall be determined by the sending side.

3) The regular period of sojourn in the host country for students identified by this agreement shall be ten months. Shorter or longer periods of sojourn (five to 15 months) may be provided for by prior agreement between the educational authorities on each side without effect on the total number of academic man-years specified.

4) Further concrete details will be worked out by means of direct negotiations between representatives of both parties in the field of education.

5) The appropriate educational authorities of each party will conduct negotiations prior to February 1, 1960, regarding the arrangement in their respective countries of study courses in English and Russian languages, to which each party will send up to 25 students, who may be accompanied by one or two language specialists, for sojourn in the country of up to 12 weeks during the period June–September.

If they do not come to an agreement prior to February 1, 1960, this exchange may be considered for 1961. If the exchange takes place in 1960, it may be repeated in 1961 by agreement between the appropriate educational authorities.

6) The United States side will arrange to invite Soviet teachers of the Russian language to the United States in the academic year 1960–61 to occupy positions in American universities for teaching the Russian language. Arrangements with respect to positions to be occupied by Soviet teachers, transportation expenses, salaries, lodging, and academic benefits as enjoyed by their American colleagues of similar standing will be the subject of negotiation between the appropriate institutions of each party. The Soviet side will undertake to make similar arrangements to invite American teachers of English to Soviet universities.

7) Both parties agree to provide for exchanges in the years 1960–61 of professors, teachers, and researchers in the approximate number of five persons each year from each university; the exchanges will take place between the following institutions: Moscow and Columbia Universities, Leningrad and Harvard, Kiev and Yale, Indiana and Tashkent. The duration of the visits and the conditions of the exchanges will be determined by agreement between the afore-mentioned universities. Nothing in this paragraph excludes the conclusion of additional agreements between American universities and colleges and Soviet universities and other institutions of higher learning.

8) Both parties agree to provide for the following exchanges of specialists in education in the years 1960–61.

(a) Two delegations comprising five to six persons each for 20 to 30 days to study technical education and preparation of qualified workers in machine building, ore mining, and food industry in establishments for public services. The United States delegations will represent the American Association of Junior Colleges and the Engineers Joint Council and will be interested in aspects of technical education in U.S.S.R. The Soviet delegations will study training of skilled labor in afore-mentioned fields and, if they desire, may also study American technical education in general.

(b) One delegation comprising two to three persons from each side for a period of three to four weeks to study organization, sources, and techniques of conducting educational research (spring 1960).

(c) One delegation of three persons from each side for a period of three to four weeks to study methods and results in teaching of foreign languages (English, Russian, and other Western as well as Eastern languages) at the primary and secondary schools as well as teacher-college and university levels (spring 1960).

(d) The Soviet side will receive one American delegation of two to three persons for four weeks to study education in arts (choreography, music, painting, graphics, plastic art, etc.) at different levels. They will visit schools and out-of-school institutions (spring 1960).

The American side will receive one Soviet delegation of two to three persons for four weeks to study school construction and the production of training equipment for schools.

(e) One delegation from each side comprising five to seven persons for up to four weeks between the American Library Association and appropriate Soviet organizations to visit libraries and bibliographic centers and also to study (i) bibliographic techniques, compilation of indices and other techniques of library documentation and analogous processes; (ii) methods of reproduction and dissemination, including the operation of specialized libraries and centers; and (iii) methods of training library personnel, establishment of the level and organization of technical processes.

9) Both sides recognize the desirability of continuing the exchange of literature in the methodolgy of teaching, educational films, and other pedagogical materials.

Annex to Section V. Educational Exchanges

1) Both sides agree to provide access for each student to all scholarly and scientific materials necessary in his field of study on the basis of a mutually agreed study plan.

In case of necessity, this plan can, where appropriate and possible, include work in research institutions and contacts with scientists in other research institutions which are outside the system of higher education establishments.

2) Both sides agree to provide for living quarters for a wife of any married student who may desire to remain with

him during the school year; and to permit the wives of other married students at least one 30-day visit to their husbands during the school year or at its termination. The receiving side will bear no expenses for the travel or sojourn of visiting wives.

3) Each receiving side will bear, through appropriate agencies or organizations which it may select, the following expenses: tuition and fees for training in institutions of higher learning and for living quarters and monthly stipend in an amount to be subject to an agreement in advance by both sides.

In the case of a student's illness or accident, the receiving side will bear all medical costs, including hospital expenses, within limits established by each side.

All other expenses including travel to the country, to the place of study within the country, and return to the home country at the end of the school year will be borne by the sending side with the exception of situations to be mutually agreed upon in advance.

4) The sending side will submit to the appropriate educational authorities of the receiving side at least five months before the beginning of the academic year a list of its students together with information on the course of study of each student.

Notification of final acceptances and placement of the students must be given at least two months before the beginning of the academic year.

5) Each side may send, at its expense, its representatives to the host country to familiarize themselves with the conditions of study and sojourn of their students.

Section VI. Cooperation in the Field of Public Health and Medical Sciences

1) Both parties affirm their interest in intensifying the struggle against serious diseases which are the enemy of all mankind. As a step toward the achievement of this goal both parties will make efforts to put into effect the agreed program for cooperation in public health and medical science, which for the years 1960–61 contemplates, in particular, the measures described below.

Details of specific exchanges will be agreed upon by direct negotiations between the U.S.S.R. Ministry of Health and the U.S. Public Health Service.

2) The U.S.S.R. Ministry of Health and the U.S. Public Health Service will facilitate cooperation between scientific-research institutes of the U.S.S.R. and corresponding governmental, and the below-specified and other mutually agreed upon non-governmental, research organizations of the United States conducting studies on the problems of cancer, cardiovascular illnesses, poliomyelitis, and on other important problems of medicine.

First of all both parties will facilitate the establishment and development of contacts and cooperation between the following Soviet and American scientific institutions: (a) For the Soviet side, the Institute of Experimental and Clinical Oncology, Academy of Medical Sciences of the U.S.S.R., and for the U.S. side, the Sloan-Kettering Institute and National Cancer Institute. (b) For the Soviet side, the Institute of Therapy, Academy of Medical Sciences of the U.S.S.R. and, through it, other Soviet scientific institutions engaged in the study of cardiovascular diseases; and, for the U.S. side, the National Heart Institute and, through it, other American scientific institutions engaged in the study of cardiovascular diseases. (c) For the Soviet side, the Institute for the Study of Poliomyelitis, Academy of Medical Sciences of the U.S.S.R., and, for the U.S. side, the Research Foundation, Children's Hospital, Cincinnati, and the National Institutes of Health (Division of Biological Standards).

The afore-mentioned organizations shall be encouraged by both parties to exchange plans of scientific-research work and information about research conducted, to organize joint scientific studies, to exchange specialists, and to participate in yearly joint scientific meetings which shall be convened by the afore-mentioned institutes, or the U.S.S.R. Ministry of Health, or the U.S. Public Health Service, alternately in the U.S. and the U.S.S.R.

In 1960 such meetings shall take place at the Sloan-Kettering Institute (U.S.A.), the National Heart Institute (U.S.A.), and the Institute for the Study of Poliomyelitis, U.S.S.R. Academy of Medical Sciences.

3) Both parties shall facilitate an exchange of high-level specialists and junior scientific workers, numbering up to 20 persons on each side, for a period of up to one year on the basis of general reciprocity for familiarization with the work of scientific-research institutes and establishments of the U.S.S.R. and U.S.A. enumerated in paragraph 2 of the present section, and also other scientific establishments of both parties for the exchange of experience, or for the conduct of jointly agreed upon research.

Scientists sent to the yearly joint scientific meetings of the institutes conducted in accordance with paragraph 2 and members of delegations provided for in paragraph 4 of this section of the agreement are not included in the above specified number (20 persons).

4) Both parties will provide for an exchange in 1960–61 of five delegations of three to six persons each for a period of three to four weeks.

Delegations of the Soviet Union will study the following subjects in the U.S.A.: (a) malignant neoplasms (etiology, pathogenesis, and the therapy of tumors), and also biochemical and histochemical research on tumors; (b) the pathology of cardiovascular systems (hypertension, atherosclerosis, coronary insufficiency); (c) thoracic surgery (cardiology, artificial circulation of the blood); (d) virology (the genetics of viruses); (e) industrial medicine and hygiene (organization of scientific research on labor hygiene and occupational diseases, familiarization with scientific research on important problems of labor hygiene such as silicosis, industrial toxicology, physiology of labor, and occupational disease).

U.S. delegations will study the following subjects in the U.S.S.R.: (a) infectious diseases and microbiology; (b) neurophysiology and pathology; (c) metabolism and genetics; (d) medical ecology; (e) maternal and child care and related research.

5) The local expenses of specialists, including internal travel, involved in the exchanges covered in this section shall, except as otherwise agreed in specific cases by the U.S.S.R. Ministry of Health and the U.S. Public Health Service, be met in the case of visits not exceeding six weeks by the sending side and in the case of visits exceeding six weeks by the receiving side, on terms to be agreed upon in each case between the U.S.S.R. Ministry of Health and the U.S. Public Health Service.

6) Both parties shall facilitate the publication of works on the most important problems of medical science by American research workers in Soviet medical journals and by Soviet research workers in American medical journals.

7) Both parties shall facilitate the further development of exchanges of medical journals and books between Soviet and American libraries and institutions, as well as the exchange of medical films.

8) Both parties agree to inform the World Health Organization of the activities carried out under this section of this agreement. . . .

Section X. Exchange of Publications

1) Both parties, having exchanged their views on the problems of distributing the magazines *Amerika* in the Soviet Union and *U.S.S.R.* in the United States, have agreed on the desirability of facilitating the distribution of these magazines on the basis of reciprocity. Examination of measures taken by both parties to achieve this end will continue, with the aim of increasing the distribution of these magazines to 77,000 copies each.

2) Both parties agree to assist in the exchange of books, magazines, and other publications devoted to scientific, cultural, technical, and educational subjects by encouraging exchanges of books and publications between universities and public libraries of the U.S. and U.S.S.R.

Section XI. Exchange of Exhibitions

1) Both parties will provide for the exchange of exhibitions during 1960–61.

Soviet exhibitions in the U.S.A.: (a) medicine and medical services; (b) children's books and illustrations; (c) children's artistic and technical work (drawings, models, and toys made by children).

United States exhibits in the U.S.S.R.: (a) medicine and medical services; (b) plastics; (c) transport.

2) Other exhibitions, as well as participation in internation exhibitions which take place in each country during 1960–61, will be determined by mutual agreement. The parties will likewise discuss in the near future the possibility of exchanging national exhibitions in subsequent years.

Radioactive Waste Disposal Discussed in Monaco

A week of discussions at the international conference in Monaco on the disposal of radioactive waste ended on 21 November on a note of general agreement that whatever methods of disposal are chosen, they must have the overriding aim of not endangering man either immediately or in the long run. This view was summed up in a closing speech by G. W. C. Tait, director of the Division of Health, Safety, and Waste Disposal of the International Atomic Energy Agency, which had organized the conference jointly with UNESCO and in cooperation with the Food and Agriculture Organization. The conference was attended by 308 specialists from 32 countries and 11 international organizations.

The meeting opened on 16 November with a speech by the IAEA director general, Sterling Cole, who emphasized that the problem of radioactive waste was really one of storage rather than of disposal. Even if there is no ready use for this material now, he said, this does not mean that a use will not be found in the course of time.

In the papers presented at the conference and in the course of the discussions that followed, the problem of waste disposal was discussed from all the major practical and theoretical points of view. Some scientists gave an indication of the amount of the wastes now being produced or likely to be produced in the future. For example, an American scientist stated that in the United States alone, the nuclear power industry would have produced, by the year 2000, wastes amounting to about 3 million curies of activity.

Solutions in Various Countries

One scientist expressed the view that the normal operation of a nuclear reactor raises no great problems; the main danger lies in the operation of fuel reprocessing plants. As for the problem of atmospheric contamination, he said, the solution lies both in good design of nuclear plants, so as to limit the production of wastes, and in improved methods of cleaning the air released by these plants.

An expert from Norway, speaking of the potential suitability of the earth's atmosphere for disposal operations, said that radioactive particles remain in the stratosphere for a period long enough to allow certain substances to become harmless before they return to the earth's surface. A scientist from the Danish Atomic Energy Commission told how the Riso research establishment has constructed a decontamination plant for reducing radioactivity in liquid waste to less than one-tenth of the maximum set for drinking water. A scientist from the U.K. Atomic Energy Authority described disposal methods at Harwell, where extreme care has to be taken because low-level liquid waste is discharged after special treatment into the Thames, the main source of London's drinking water. No solid waste is buried at Harwell, because of the danger of possible seepage into the river. Methods now being tested in France for the disposal of solid wastes were described by two experts from the French Atomic Energy Commission. A Soviet scientist said that the fixation of radioactive material in glass under high temperature is being studied in the Soviet Union; this process is intended to make the material solid and to reduce its solubility before it is buried.

Several papers dealt with the legal, administrative, and other general aspects of waste disposal. Some of the experts stressed the international nature of the problem and said that existing regulations in other, similar fields might serve as models in devising international regulations for the disposal of radioactive waste.

Sea Disposal

A subject which provoked considerable discussion concerned waste disposal in the sea. A Soviet scientist said that experts in his country hold the view that no isolation of deep waters exists in the oceans. An expert on oceanography from the United States said that ten times as much money and as many facilities as are now available are needed for research on this subject; that radioactive waste is bound to get into the seas, whether one wants it or not; and that the more we find out about the circulation of radioactive elements in the oceans, the more economically we will be able to dispose of them. A Soviet scientist suggested that physicists and chemists should collaborate with oceanographers in studying the problem. Another Soviet expert maintained that disposal in the ground is the safest method available today; that the material should be enclosed in solid blocks of concrete or glass and stored at appropriate depths and under the permanent control of human beings.

News Briefs

The History of Science Society will meet in Chicago, 29–30 December, at the Congress Hotel, in cooperation with the American Historical Association. A broad program has been arranged by the officers of the History of Science Society, under the direction of Henry Guerlac, president of the society and professor of the history of medicine at Cornell University. The program will include a business meeting of the society, as well as a business meeting of the George Sarton Memorial Foundation. The latter, a nonprofit institution,