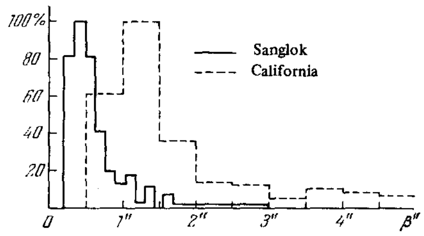

FIG. 4. Histograms of β for Mt. Sanglok [14] and Junipero Serra Peak Station, California [15].

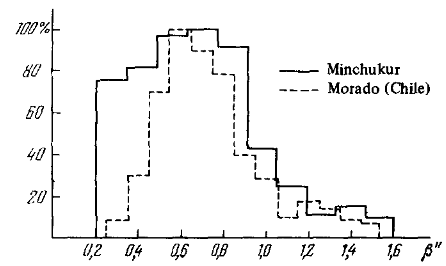

FIG. 5. Histograms of β for Mt. Maĭdanak (Minchukur) [20] and Morado Peak, Chile [21].

astroclimatic study by climatologists as nearly equivalent in regard to conditions and free atmosphere. Study of Mt. Sanglok in Tadzhikistan, which had been chosen on the basis of these considerations, was begun in the early '60's. Astroclimatic studies using the old[12] and new[13-14] methods indicated exceptionally small values of β for this site. Unfortunately, Mt. Singlok is in the region of the rapidly developing Nurek industrial center. Histograms of β for Mt. Sanglok and one of the sites in California with good images[15] are given in Fig. 4. In the autumn of 1967, O. A. Semenova of the Central Asian Scientific Research Hydrometeorological Institute drew my attention to the area of the Minchukur Weather Station in southern Uzbekistan as a highly interesting one from the standpoint of astronomical requirements. A detailed analysis of the weather data[16,17] indicated that in the amount of clear-sky time and the temperature and wind characteristics this region surpasses the astronomically promising regions of Chile[18]. In the fall of 1969, the Tashkent Astronomical Institute made the first astroclimatic observations in the Minchukur area, which yielded extremely encouraging results[19]. The results of a year's observations[20] using the double-beam instrument on the dominant peak in the region—Mt. Maĭdanak—appear in Fig. 5. For comparison, the same figure gives the results of measurements of β by an objective method for Morado Peak[21]. The good quality of images obtained on the mountaintops of Central Asia is explained by the low wind speed in this region, which is remote from the oceans and thoroughly insulated on the south and east by high mountains.

However, rather much still remains to be done for utilization of all of the opportunities afforded by the atmosphere at the sites investigated. Study of the aero- and thermodynamics of the telescope towers and the preparation of high-quality optics and high-information image receivers are the basic problems without solution of which it would, of course, be impossible to create a highly efficient astronomical telescope. There is no doubt that installation of such instruments at the sites that have been found is a task of prime urgency for our astronomical establishment.

[1] I. S. Bowen, Astron. J. 69 (10), 816 (1964).
[2] G. W. Ritchey, L'Astronomie **42**, 179 (1928).
[3] S. B. Novikov, A. A. Ovchinnikov, and P. V. Shcheglov, Astron. Tsirk. No. 554 (1970).
[4] J. A. Anderson, J. RAS Canada 36 (5), 177 (1942).
[5] A. Danjon and A. Couder, Lunettes et telescopes, Paris, 1935.
[6] V. V. Rodionov and S. P. Yatsenko, Astron. Tsirk. No. 482 (1968).
[7] V. É. Slutskiĭ and A. G. Printsev, ibid. No. 593 (1970).
[8] S. B. Novikov, in: Atmosfernaya optika [Atmospheric Optics], Nauka, 1970.
[9] H. Siedentopf and F. Unz, ESO Publ., March, 1964.
[10] A. V. Bagrov and A. A. Ovchinnikov, Astron. Tsirk. No. 558 (1970).
[11] V. V. Rodionov, ibid. No. 554 (1970).
[12] O. P. Vasil'yanovskaya, Byull. Inst-ta Astrofiz., Dushanbe, No. 39–40 (1965).
[13] S. B. Novikov and P. V. Shcheglov, Astron. Tsirk. No. 491 (1968).
[14] A. V. Bagrov, Yu. F. Nikitin, G. V. Novikova, S. B. Novikov, and P. V. Shcheglov, ibid. No. 574 (1970).
[15] M. F. Walker, Publ. Astr. Soc. Pac. 82 (No. 487), 672 (1970).
[16] G. V. Novikova, Astron. Tsirk. No. 482 (1968).
[17] G. V. Novikova, in: Atmosfernaya optika [Atmospheric Optics], Nauka, 1970, p. 10.
[18] ESO Annual Report, 1969.
[19] V. É. Slutskiĭ and V. G. Khetselius, Astron. Tsirk. No. 573 (1970).
[20] S. P. Yatsenko, ibid. No. 637 (1971).
[21] I. B. Irvin, ESO Bull., No. 3 (1968).

G. Ya. Umarov. Development of Research on the Utilization of Solar Energy within the System of the Uzbek Academy of Sciences.

Although the efficient utilization of solar energy has always been an intriguing problem to many scientists, the very low density of the solar radiation has been an obstacle to effective use of energy in this form. Little attention was given the subject, and the amounts of money and manpower devoted to it were small.

Extensive scientific and experimental studies have indicated the possibility of efficient utilization of solar energy with the aid of modern technical facilities. In recent years, the amount of research being done in this direction has increased substantially both in the Soviet Union and abroad. Examples:

A solar furnace that concentrates the solar flux to a power of 1000 kW and a temperature of 3500°K at a focus 30 cm in diameter has been built in France. Work is being done on the large-scale preparation of pure and ultrapure materials and alloys with desired physicotechnical properties.

Solar energy is used extensively in the USA, Japan, and Israel for domestic and communal purposes.

In the USA, such firms as General Electric, Thompson-Ramo-Wooldridge, Ryan, Goodyear, and

Electrooptical Systems are pressing the development of solar-power systems for use in space.

On the initiative of French scientists, a Mediterranean association for the utilization of solar energy has been formed and is active in the African countries.

As a member of a delegation from the USSR Academy of Sciences, the author recently visited the Sudan, where a unified center for the utilization of solar energy is currently being organized for all Arab countries.

Here at home, this problem is being studied at Tashkent, Ashkhabad, Erevan, Moscow, Leningrad, and other cities.

Since 1965, the Ukrainian Academy of Sciences has published the All-Union journal "Geliotekhnika," an English-language version of which is produced in the USA.

Our Republic has tremendous grazing areas in the regions of the Kara-Kum and Kyzyl-Kum deserts, where the problem of supplying people and animals with drinking water is especially acute. In many cases, the available undergound water is salt and bitter. For this reason, one of the selected research topics was solar-energy desalination of these waters as a contribution to expansion of the Republic's grazing lands. We began by developing a number of variants of the solar desalinator. In collaboration with the Bukhara Pedagogical Institute, a solar desalinating unit with an area of 700 m^2 was built at the Kyzyl-Kum center on the "Shafrikan" State Farm and placed in operation in 1970. During that year, the decision was taken to construct desalinators on five more State farms of the Bukhara region.

We are now developing lightweight portable desalinators for use by shepherds and their families. Each of these units delivers 10 liters of drinking water per day. The Expert Commission of the State Committee in the USSR Council of Ministers on Science and Technology has adopted a resolution calling for widespread introduction of these desalinators.

At our latitudes, an amount of solar energy equivalent to that of 200 kg of conventional fuel falls on each square meter of area in a year; 2/3 of this arrives during the summer semester and 1/3 during the winter semester.

If the sheet-flow water heaters developed by the Physico-technical Institute of the Uzbek Academy of Sciences, which serve simultaneously as roofing, were mounted atop 4—5-story residential buildings, the residents would be supplied with hot water for eight months out of the year. Each family would have 300 liters of hot water at 60°C per day.

Residential buildings could be heated in winter and air-conditioned in summer by solar energy.

At our latitudes, solar heating would not, of course, completely eliminate the need for fuel heating, but it would reduce fuel consumption by more than 50%. We have submitted proposals to the Republic State Committee for Construction calling for the design of such buildings. We attach great importance to the domestic and communal utilization of solar energy. In the Charvak, the Physico-technical Institute has installed and begun operation of a water-heating unit with an area of 80 m^2.

Just recently, in response to a proposal of the Physico-technical Institute of the Uzbek Academy of Sciences, the Republic Ministry of the Municipal Economy has approved design work on standardized solar-energy baths and laundries.

A plant for the series production of domestic and communal solar-power devices has been designed on the basis of developmental work done at the Physico-technical Institute of the Uzbek Academy of Sciences. The program calls for an annual production of 25 000 solar boilers and solar water heaters with an area of 50 000 m^2.

Working with the Karshi Pedagogical Institute, the Physico-technical Institute of the Uzbek Academy of Sciences has developed a variety of solar-energy accumulators and is now equipping a number of collective and State farms with greenhouses having such accumulators.

We are doing a great deal of work toward the development of sunlight concentrators for solar-power and solar high-temperature equipment. We have developed a variety of inexpensive 5-meter-diameter concentrators that deliver sufficiently high temperatures at their foci and are conducting research and designer development of Stirling gas-piston engines, which convert thermal to mechanical energy. The efficiency of these engines has now been brought up to 30%. A self-contained solar power plant putting out up to 1 kW is being built on the basis of this converter and these concentrators; it will subsequently be converted to produce ten kilowatts. The Presidium of the Uzbek Academy of Sciences recently allocated 20 hectares on the grounds of the Institute of Nuclear Physics for construction of a large testing facility for solar-engineering structures.

Thus, solar energy can be put to use extensively right now in agriculture, construction, industry, and space:

In the Republic's collective and State farms for desalination of water, heating greenhouses and hothouses, pulsed irradiation of crop seeds, drying agricultural products, and supplying power for self-contained systems.

In construction, for heating, air-conditioning, and hot-water supply in urban and rural areas, making it possible to save fuels in short supply now used to produce low-potential heat. When it is remembered that up to 30% of all the fuel extracted in the country is used for this purpose, the urgency of this problem becomes obvious.

In industry, for the production of high-temperature and refractory alloys, ultrapure materials, caprolactum and octolactam and for other technological problems.

In space, for the development of self-contained powerplants with capacities in the tens of kilowatts, for cutting and welding metals (in space), and for other technological problems.

My paper would be incomplete if I failed to mention the projects being worked on at other institutes and organizations in Tashkent.

The Institute of Electronics of the Uzbek Academy of Sciences is engaged in solar-furnace research on the properties of materials, as well as the direct conversion of solar energy into electricity.

Work on means to prevent overheating of buildings by sunlight is being done at the Tashkent Scientific Research Planning Institute. A plant is being built at Tashkent for the production of sun-protection devices. Bukhara will be the site of a plant for the long-run production of solar boilers and water heaters. Thus, work toward the utilization of solar energy has now been developed quite broadly at Tashkent. However, the scientific, design, and production efforts are uncoordinated and under the jurisdiction of various ministries and departments.

Most of these subdivisions are understaffed and do not have modern equipment or the appropriate production base; as a result, they serve the national economy inefficiently. Under these conditions, coordination of the projects is extremely difficult, and it is practically impossible to manipulate the available scientific and production possibilities and deal efficiently with problems of prime importance.

The following conclusion takes form from all of the above: it is necessary to concentrate the scientific, designer, and production work forces concerned with the problem of solar-energy utilization into a single association at Tashkent. This will make possible a sharp increase in the efficiency of the work and speed up introduction of scientific and technical achievements into the national economy. This will be a practical step toward implementation of the decisions taken by the Twenty-fourth Congress of our Party.

Translated by R. W. Bowers