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This report presents unevaluated information on Soviet Bloc International Geophysical Year activities selected from foreign-language publications as indicated in parentheses. It is published as an aid to United States Government research.

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Ukrainian Conference Reports First 5 Months of IGY Results in Ukraine

The following comprises the full text of a report by T. S. Lebedev, Candidate of Geological-Mineralogical Sciences, on the Second All-Ukrainian Conference of IGY participants which was held in Kiev on 28 and 29 November 1957. The First All-Ukrainian Conference was held on 26 and 27 March 1957 to discuss progress in preparations for the IGY.

For more than 6 months, 16 scientific institutions of the Academy of Sciences Ukrainian SSR, Academy of Sciences USSR, Ministry of Higher Education Ukrainian SSR, Ministry of Communications Ukrainian SSR, and the Ukrainian Hydrometeorological Service, have been conducting systematic scientific observations according to the IGY program on the territory of the Ukrainian SSR.

Solar activity and cosmic radiation, observations of artificial earth satellites and meteors, aurora and variations of the geomagnetic field, planetary and meteorological phenomena, structure of the ionosphere and radiowave propagation, pole precessions and latitude fluctuations -- this is far from a complete list of the questions in which the Ukrainian scientists are engaged during the IGY.

The launching in the Soviet Union of artificial earth satellites has significantly expanded the number of scientific problems whose development will make it possible to solve certain important problems in geophysics, astronomy, and cosmogony. In the Ukraine, observations of the artificial satellites have already acquired significant extension.

It should also be emphasized that the principal scientific institutions on the all-union level (Poltava Gravimetric Observatory of the Academy of Sciences Ukrainian SSR, Astronomical Observatory of Odessa University, Crimean Astrophysical Observatory of the Academy of Sciences USSR) are successfully accomplishing and coordinating the works of a whole number of scientific institutions according to corresponding problems of the IGY ("latitude fluctuations and precession of the Earth's pole," "study of meteors," "investigations of solar activity").

The first data of IGY observations have been obtained and have already been partially processed. The first months of work also carried with them certain corrections and methods; techniques, and even the program of investigations (for example, observations of artificial Earth satellites), were made more exact. Shortcomings were also manifested which occurred during preparations for observations. The latter now have been eliminated or gradually are being eliminated in the process of conducting investigations. Observation data is regularly sent to the appropriate all-union or international IGY center.

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The Second All-Ukrainian Conference of IGY Participating Institutions was convoked by the organization committee for the conduct of the IGY under the Presidium of the Academy of Sciences Ukrainian SSR (V. G. Bondarchuk, chairman of the organization committee and Academician of the Academy of Sciences Ukrainian SSR) on 28 and 29 November 1957 in Kiev in the Academy of Sciences Ukrainian SSR to discuss the first results of scientific investigations completed during the previous 5 months. A broad exchange of information concerning progress and results of observations took place at the conference. Also, scientific papers and reports on various IGY problems were heard and discussed.

All sessions were under the chairmanship of Prof S. I. Subbotin, deputy chairman of the organization committee and a corresponding member of the Academy of Sciences Ukrainian SSR. Opening the conference, Prof Subbotin emphasized the great role of Ukrainian scientists in conducting scientific observations according to the IGY program and expressed the certainty that the entire complex of investigations will be successfully and promptly accomplished.

Information reports by the representatives of participating IGY institutions were heard and discussed the first day of the conference.

L. S. Galkin, Candidate of Physicomathematical Sciences and scientific secretary of the Crimean Astrophysical Observatory of the Academy of Sciences USSR, reported that the observatory was successfully conducting a large and composite work on a whole series of IGY problems and subjects. The field of geomagnetic variations is being studied. Spectral, spectrophotometric, and radar investigations of aurora and airglow also are of great interest. Significant work is being directed toward investigating the state and structure of the ionosphere. There is a great scientific and practical interest in investigations of fields of atmospheric disturbances which affect radio communications. Special attention is being given to work on the problem "investigations of solar activity." Hourly recording of cosmic radiation intensity has been organized. A special station for visual and photometric observations of artificial satellites has been equipped at the observatory. A bulletin on observations is issued regularly. In addition, data on a given period of time is obtained and is systematically sent to appropriate scientific institutions in the Soviet Union and foreign countries.

A. A. Yakovkin, director of the GAO (Main Astronomical Observatory) of the Academy of Sciences Ukrainian SSR and a corresponding member of the academy, told the conference participants about the work being conducted according to the IGY program in the scientific institution under his direction. The GAO is participating in three IGY themes. The first of these is the study of solar activity. Observations of the chromosphere and photosphere of the Sun are being made with the aid of a chromosphere-photosphere telescope. The second theme is "investigations of meteors,"

which is also being worked on with sufficient success. Meteors are photographed with a new original Soviet device, a "meteor patrol," which was designed in the Astronomical Observatory at Odessa University and manufactured in the Odessa "Kinap" plant.

Work on the theme "determination of the exact coordinates of the Moon and stars" will make it possible to accumulate much new data on these parameters, which will aid in more exactly computing the possible fluctuations in the Earth's poles. Associates of GAO have designed a special film plate holder with a 400-millimeter objective which allows photographing the Moon and 10-15 stars simultaneously.

Work on determining the center of the Moon has certain theoretical interest. The latter, for some reason, does not enter into the IGY subject program, not only at GAO but throughout the entire Soviet Union, at this time, when work on this problem is being conducted. Regular observations of artificial earth satellites have also been organized at the observatory.

Prof M. S. Eygenson, director of the Astronomical and Magnetic Observatory at L'vov University, in his report, told about observations of solar activity. Since 5 October 1957, observations of the artificial Earth satellites have been conducted. Sputnik I was observed in more than half of all its revolutions, both visually and photographically, and 155 times by radio. Visually it was observed three times in L'vov. Sputnik II was recorded 64 times by radio and was seen once. Eygenson informed the conference participants on the All-Union Conference on Sun Service, which was held in L'vov recently.

V. P. Tsesevich, director of the Astronomical Observatory at Odessa University and a corresponding member of the Academy of Sciences Ukrainian SSR, emphasized in his information report that Odessa Observatory is a principal scientific institution in the USSR working on the problem "study of meteors." In this connection, the goals toward which the problem is directed were promptly made more exact, methods were developed, and a new device, the "meteor patrol," was designed. During the period of operation of the "meteor patrol" approximately 100 photographs of meteors were obtained, but not all of them yield to suitable processing because of the lack of exact geodetic tie-ins of an observed point.

For meteor observations, three stations have been built which are located at the vertices of the angles of a right triangle (Mayaki, Krizhanovka, and the Botanical Garden of the university at Odessa). Radar observations of meteors are also being conducted. In Mayaki, besides the meteor station, several pavilions for the astrophysical observatory have been constructed.

At Odessa Observatory, broad observations of artificial satellites have been organized.

Z. M. Aksent'yeva, director of the Poltava Gravimetric Observatory and a corresponding member of the Academy of Sciences Ukrainian SSR, told about the work of the observatory and the fact that regular observations according to the IGY program were begun promptly on 1 July 1957. The program has been expanded on account of the investigations of peculiarities of operation of instruments. In this direction, a significant volume of investigations has been completed.

The Poltava Gravimetric Observatory is the all-union center of latitude service, which unites seven stations. As the principal institution, the observatory should collect and process all data in the Soviet Union, but data from the seven stations (Kazan, Pulkovo, Irkutsk, Moscow, Kitab, Blagoveshchensk) are not being received regularly. This hinders prompt sending of information to the world center in Moscow, the Scientific Research Institute of Aeroclimatology.

Experimental works on the study of pole precession according to the data of azimuthal observations are being accomplished. Also, research on the study of gravitational variations are being conducted. For this purpose, a special observation point in one of the mines in Krivoy Rog, at a depth of 250 meters, has been equipped and is functioning. In the future, it will be necessary to build a similar post in one of the mines in the Carpathians.

Ye. V. Sandakova, senior scientific associate of the Astronomical Observatory at Kiev University and a Candidate of Physicomathematical Sciences, elucidated on the results of observations which are being conducted at Kiev University.

A major task was accomplished for putting in operation meteor stations (at Tripillya in Obukhovskiy Rayon and at Lisnyaki in Kieyvo- Svyatoshinskiy Rayon), where a "meteor patrol" has been established. A device for calibrating meteors was designed. Also, radar observations of meteors are being conducted.

Investigations of solar activity are proceeding in an entirely satisfactory way. Observations have already been conducted on 133 days. Spectrohelio-chromosphere flares were observed on 82 days. Unfortunately, during a world interval, very few observations were made because of cloudy weather. Data on solar activity are being processed and sent to the appropriate centers.

Since 6 October 1957, observations of satellites have been made regularly. By using optical barriers, the moment of passage and the coordinates of the satellites are determined exactly.

The polar expedition of the university, which went to Bukhta Tiksi in the summer, is completing preparations according to plan for observation work there.

A. T. Chekirda, Candidate of Physicomathematical Sciences and deputy director of the Astronomical Observatory at Khar'kov University, told the conference about the work on solar activity, time service, and satellite observations being conducted successfully. A spectroheliograph for investigating the chromosphere of the Sun has been made at the observatory. The chromosphere is being photographed in the calcium and hydrogen line. Solar radiation is recorded by a special mirror with a 6-meter diameter. Time service is provided with the best quartz clock-frequency standard in the country.

Arificial Earth satellites are observed photometrically, optically, and by radio signals.

Docent B. L. Kashcheyev, head of the Chair of Fundamentals of Radio Engineering at Khar'kov Polytechnic Institute, reported on the state of observations in appropriate IGY themes. The chair is conducting research on meteor activity and ionosphere structure. Observations of meteors began on time. At the beginning of November, 10,150 meteors had been recorded. The chair has developed and placed into operation a system for eliminating industrial disturbances. Devices were constructed for determining the velocity of meteors.

The study of the homogeneity of the ionosphere is also proceeding normally, but rests chiefly on the enthusiasm of the associates, owing to the periodic curtailments of necessary personnel by the administration of the institute.

Observations according to the IGY program are being conducted by 25 stations and many ship installations of the Hydrometeorological Service Ukrainian SSR. Emphasizing this, V. M. Vasil'yev, senior engineer of the Hydrometeorological Service Ukrainian SSR, reported further that on the territory of the Ukraine, visual and instrument observations are being made of wind direction, general visibility, cloudiness, soil moisture, noctilucent clouds, aurora, etc. The complex study of hydrographic and hydrometeorological peculiarities of the Black Sea Basin has been widely extended.

M. I. Goys, scientific associate at the Ukrainian Scientific Research Hydrometeorological Institute, told the conference that the institute is conducting the major part of its IGY work at its Agrometeorological Station (Bagrinova Gora, Kiev). Since the beginning of the IGY, a number of problems in meteorology, actinometry, evaporation from the soil and others is being worked on. Observations of the spectral composition of solar radiation with the aid of special devices are being conducted. Study of the

yellow-green part of the spectrum has begun. Positive attention is being given to the study of atmospheric electricity (it is planned to conduct observations of current peaks from airplanes at an altitude of 7,000 meters. In addition, in 1958, expeditionary research will be made by a special maritime ship, the Mgla.

On observations of variations of the Earth's magnetic field, which are being made by the Odessa Magnetic Station of the Ministry of Communications Ukrainian SSR during the IGY, A. I. Storozhinskiy, senior engineer, spoke. The station was organized at the end of the last century on the initiative of Prof O. V. Klosovskiy. P. T. Pasalskiy, a leading magnetologist, was the first director of this station. Continuous recording of all elements of the geomagnetic field are conducted with the aid of complex instruments. The 24-hour course of the magnetic field, secular variations, magnetic storms, and effects of solar flares are studied.

A. P. Bondarenko, senior scientific associate of the Institute of Geology of Useful Minerals of the Academy of Sciences Ukrainian SSR, reported that the institute has built and has begun to equip three stations (near Uzhgorod, Striy, and Rovno) for observations of short period variations of the Earth's electromagnetic fields in connection with the IGY program. Recordings at all stations are made continuously.

Head of the magnetic station of the Institute of Geological Sciences of the Academy of Sciences Ukrainian SSR (Demidiv, near Kiev) G. A. Krzhivanek, Candidate of Geological-Mineralogical Sciences, informed the conference that the station was built for the study of variations in the geomagnetic field.

Seven reports and papers were read at the morning session on 29 November.

V. P. Tsesevich, corresponding member of the Academy of Sciences Ukrainian SSR from Odessa ("On Photographic and Photometric Observations of Artificial Earth Satellites"), talked about the number of peculiarities in the movements of the satellites. Change of orbit, rotation, brightness of the flash of the satellites, etc., permits the study of a whole number of physical peculiarities of the Earth's atmosphere, as well as the obtaining of new data on the displacement of the mass within the Earth. Within the USSR, 66 stations for satellite observation have been organized. At the observation station of Odessa Astronomical Observatory (Mayaki), the rocket carrier of Sputnik I was photographed with a seven-camera astrograph. Shortcomings in photographic fixes of rockets or satellites are hindrances in determining coordinates.

Observations of the rocket-carrier showed that the change in the brightness of its flash depends on the distance and coefficient of absorption of light on the way to the observer, the position of the satellite in orbit (the phase of its rotation around a certain axis!), from the change of the coefficient of light absorption on the way from the Sun to the satellite, and

perhaps on other factors. To solve this problem correctly, it is necessary to perform mass observations of the brilliance of the flash, both visually and by photographic means. Visually, the degree of brightness of the satellite can be compared with the stars against whose background the satellite moves. These determinations can be performed with an accuracy of 0.1 star magnitude. During photographic recording, standardization of negative materials and photographic cameras is necessary.

I M. Migulin's paper on the "Lifetime of Artificial Earth Satellites" evoked special interest from the conference participants. Calculation of the lifetime of satellites was made on the following assumptions: the satellite moves in a circular orbit (this means that the eccentric force and the force of gravity are equal); the temperature in the orbit is constant. Considering these factors, a number of sufficiently complex mathematical calculations for various specified radii of the satellite orbit were made. Calculations showed that the end of the life of the rocket-carrier of Sputnik I would come on 11 December 1957 and Sputnik I itself would cease on 27 January 1958. In such a way, the rocket-carrier existed 67 days and the satellite, 116 days. A permissible error in calculations of ± one day occurred.

Migulin presented two orginal photographs of the rocket-carrier on the background of the Big Bear Constellation which were taken by the "FED" camera and the "Kiev" camera.

Docent B. L. Kashcheyev of Khar'kov ("Investigation of Meteor Activity by Radar Method During the Existence of a Significant Level of Disturbances") stated that Khar'kov Polytechnic Institute is conducting investigations of meteor activity on a frequency of 72 megacycles. For conducting these observations, the Chair of Fundamentals of Radio Engineering has developed, built, and placed in operation a special apparatus. One of the most important components of this apparatus is the protection unit against disturbances, in whose design the differences in frequency spectra of useful signals and disturbances are made use of. Kashcheyev demonstrated to the conference participants photographic recordings which graphically showed the effectiveness of operation of this protection system.

Around 10,000 meteors were recorded during July-October 1957. Approximately 10 percent of the total number of meteors were observed for a period of more than one second. The diurnal course of meteor activity indicated the maximum as occurring during night time. The state of the maximum changes during the course of the year. The greatest hourly number of recorded meteors occurred in July. Here, meteor streams were recorded even during the day.

The report of B. S. Dudnik, scientific associate in the Chair of Fundamentals of Radio Engineering at Khar'kov Polytechnic Institute, entitled "Radar Measurements of Meteor Velocities," was devoted to clarifying the design features and possibilities of using still another new radar installation for determining meteor velocities. The diffraction character of

radio signals which are reflected from meteor trails was used for measuring velocities. The velocities of approximately 500 meteors were measured at a frequency of 8.13 meters. Reflections of radio signals received from meteor trails are very diverse and require additional investigations.

A. S. Dvoryashin, head of the magnetic station of the Crimean Astrophysics Observatory of the Academy of Sciences USSR delivered a paper on "Short Period Variations of the Earth's Magnetic Field." Short period geomagnetic variations are being studied by means of an induction loop which is coupled to a fluxmeter. With the aid of this method, variations with a period from deciseconds to several minutes and with an amplitude of not less than 10^{-8} oersteds can be recorded. It is apparent that short period variations of the Earth's magnetic field are directly connected with solar activity. This principle serves as a starting point for clarifying the nature of geomagnetic variations. It is apparent, also, that the Sun radiates active particles-corpuscles, which, on their way to the Earth, significantly change their velocity and have a great influence on the Earth's magnetic field. In addition, Dvoryashin elucidated on the question of peculiarities of propagation of this effect towards the Earth's surface.

A. P. Bondarenko, senior scientific associate in L'vov, in his paper, "On the Character of Geographic Distribution of Short Period Pulsations of Earth Currents," stated that the existence of periodic character of pulsations of Earth currents is connected with fluctuations of the height of the ionosphere layers, rapid shifts in the ionosphere of stratified ion clouds, invasions of streams of corpuscles and meteor dust, periodic motions of charged electrical particles in the Earth's magnetic field, and other ionospheric phenomena. To this time, it was held that pulsations with periods from 40 seconds and more are manifested simultaneously over nearly the entire globe.

Data of simultaneous recordings of pulsations by oscillograms at stations in Uzhgorod and Korets indicate that the form of pulsations at such a distance (approximately 550 kilometers) does not change. However, in the nature of polarization of the field, sufficient essential differences, which, evidently, are connected with peculiarities in the geological structure of these regions, were observed.

On the basis of the processing of standard recordings for the first months of the IGY, some of the general rules of distribution of pulsation periods per unit time were established. The basic maximum number of slow impulses (period length of more than 40 seconds) are observed between 0500 and 0600 GMT. Fluctuations with 30-40 second periods occur at 0400. Maximum fluctuations with a 20-30 second period occur at 0300 and with a 10-20 second period, from 0200 to 1200. Rapid fluctuations (less than 10 second period) are observed mainly during the night.

M. I. Goys and L. Z. Prokh (Kiev), scientific associates at the Ukrainian Scientific Research Hydrometeorological Institute, delivered a report "On the Results of Meteorological and Actinometric Observations for the Period July-October 1957 in Kiev." Analysis of single-station observations (Agrometeorological Station on Bagrinova Mountain in Kiev) has a number of shortcomings. However, all these diverse meteorological elements being observed made it possible to study the rules of certain atmospheric processes. The value of these conclusions is significantly increased in examining them in the context of synoptic data of the second half of 1957.

Attention was also turned to the irregularity of significant meteorological elements of the given period. To such irregularities belongs the excessive moisture of September and the dryness of October which had the least number of rainfalls in the last 8 years.)

The possible nature of these phenomena was clarified in detail. It was explained that the irregularities of precipitation and solar radiation to a certain extent are conditioned by processes of a global character. Nevertheless, such conclusions require further confirmation.

In the evening closing session of the conference on 29 November, four more papers were read, a discussion of all reports and papers was held, and resolutions were adopted.

Prof M. S. Eygenson, Doctor of Physicomathematical Sciences, delivered the first paper on "Contemporary Phase of Solar Activity, its Probable Secular Course and Geophysical Effects." The era of solar activity in which we are living is unprecedented in the secular cycles of the last 350 years. The extremely high maximum of the 11-year cycle being observed in 1957 indicates the existence of other cycles in the life of the Sun. The secular cycle of the 20th Century began in 1913 after an absolute minimum of solar activity. After this, activity, as a whole, gradually increased and is still increasing. Possibly, in 1957 it was the greatest for the entire time of observations. From previous data it was foreseen that the maximum of activity would occur in November 1957, but in 1958, it is doubtful whether the phase of the maximum will be revealed. Before the end of the secular cycle, two or four more 11-year cycles are anticipated.

The relation of change of solar activity with the level of the Caspian Sea was also established. Helioforecasting was done with precision -- the level of the Caspian rises sharply during a decrease in solar activity.

A. A. Yakovkin (Kiev), corresponding member of the Academy of Sciences Ukrainian SSR, read a paper on "Irregularity of the Earth's Rotation and Ways of Studying it." The first indications on the irregularity of the Earth's rotation were obtained as a result of observations of the Moon. The Earth changes its moment of rotation. The secular acceleration of the Earth's rotation should also be called to attention. The hypothesis on the

lengthening of the day at the expense of the loss of energy of rotation during the friction of tidal waves is expressed. The sharp jumps in angular velocity of the Earth as recorded since 1785 were left unexplained. It was established that in the last 250 years, the length of the day has increased by 0.0014 seconds. There are annual variations in the rate of the Earth's rotation. For their computation, an analytic relation was found. It can be assumed that the Moon is the custodian of time. In this connection, observations of its longitude take on the character of time service. Progress in the study of this problem lies chiefly in the improvement of observation methods.

I. V. Gavrilov (Kiev), scientific associate at the State Astronomical Observatory (GAO) of the Academy of Sciences Ukrainian SSR, reported on "Photographing the Moon Simultaneously With the Stars for Determining the Moon's Exact Coordinates." Determination of the exact coordinates of the Moon has a great significance for the solution of a number of problems of a geophysical nature. For the solution of these problems, Markowitz's method is used, according to which the Moon is photographed through filters which attenuate its illumination and compensate for its motion, thus making it possible to obtain a suitable photograph of the Moon, together with the stars. Associates of the GAO made a special device for photographing the Moon by this method. A method of observations and processing of photographs according to the IGY program was worked out.

Ye. A. Gurtovenko (Kiev), Candidate of Physicomathematical Sciences, delivered the last report on "The AFR-2 Telescope of the State Astronomical Observatory of the Academy of Sciences Ukrainian SSR and Observation Practice With it." The superiority of this new telescope lies in its simplicity, which makes it much better than spectroheliographs, which it will gradually replace. The telescope makes it possible to obtain short exposures. Gurtovenko explained the principles of operation of the interference-polarization filter with a 0.5 Angstrom band pass. The telescope is equipped with a movie camera. Photographs of the Sun which were taken with this telescope were shown. These photographs present a remarkable image of the chromosphere and prominences. Besides the Sun service, it can be used for a whole number of investigations in the field of physics of the Sun.

After the reading of the final paper, a discussion on the reports and scientific papers was held. The first results of investigations completed in the Ukraine according to the IGY program were unanimously lauded and means for eliminating certain shortcomings still evident in the work of the IGY participating institutions were indicated. The papers which were presented reflect positive scientific achievement obtained by Ukrainian scientists during the 5 months of observations. All scientific papers received a high evaluation and were recommended for publication.

At the conclusion of the conference, a resolution was adopted in which the satisfactory state of IGY observations in the Ukraine was emphasized. As a result of these observations, the first 5 months of investigations have produced new, valuable and interesting data.

Calling attention to the dependence of the majority of geophysical processes on the state of solar activity, the conference considers the conduct of the Fourth International Geophysical Year during the next maximum of solar activity, which is expected in 1967 and 1968, as expedient.

For the discussion of preliminary results of observations for the entire IGY period, it was resolved to convene the Third All-Ukrainian Conference of IGY Participants in November 1958. (Visnyk Akademii Nauk Ukrains'koi RSR, No 3, Mar 58, pp 56-62)

Soviet IGY Official Reports on Progress in USSR

In an article written for the readers of a Soviet newspaper, Valeria Alekseyevna Troitskaya, secretary of the Interdepartmental Committee for the Conduct of the IGY, presents information on the progress of this work in the Soviet Union.

More than 100 scientific institutions are engaged in IGY investigations in the Soviet Union. Many thousands of scientists, technicians, and observers are employed. About 600 stations organized and controlled by the institutions are scattered throughout all the territory of the USSR. These stations conduct numerous observations specified by the IGY program in all the divisions of geophysics which enter into the program, meteorology, geomagnetism and earth currents, aurorae and night sky illumination, the ionosphere and meteors, cosmic rays, solar activity, latitude and longitude, oceanography, glaciology, seismology, gravimetry, and rocket and artificial earth satellite investigations. Supplementary information on different geophysical phenomena is collected from scientists of numerous hydrometeorological stations, working according to a more limited program than that of the IGY stations, from airplane and ship crews, from the country's radio clubs and stations conducting observations on the artificial earth satellites, and from a wide circle of amateur observers.

More than two complex expeditions will be organized by Soviet investigators during the IGY. Among these must be mentioned the expeditions in the Antarctic, Arctic, the high mountain regions of the Pamir, the Tien Shan, the Suntar-Khayata mountain range, and the Pacific, Atlantic, Arctic, and Indian oceans.

The nonmagnetic sailing ship Zarya must make a magnetic survey in the waters of the Atlantic, the Mediterranean Sea, and the Indian Ocean, a total voyage of 50,000 miles. About a fourth of this total was covered up to the first part of January 1958. During this time many new findings were made on the distribution of the magnetic field on the oceans.

In the Central Arctic Basin continuous observations on diverse geophysical phenomena are made by two drifting stations, "North Pole 6" and "North Pole 7." One the most northern complex stations newly organized before the IGY is the station on the Island of Heiss (80°37' N), where observations for meteorological phenomena, cosmic rays, the ionosphere, the Earth's magnetic field, Earth currents, aurorae, seismic phenomena, etc., are conducted.

In Antarctica Soviet researchers have built several scientific bases from which they conduct daily observations in conjunction with scientists from all over the world. The main base in the Antarctic is Mirnyy. Other stations are Pionerskaya, located at an altitude of 2,700 meters,

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375 kilometers in the interior of the continent; Oazis, located at a distance of 360 kilometers east of Mirnyy; Vostok I, located at an altitude of 3,400 meters and 635 kilometers inland from Mirnyy; and the new station Vostok, organized in the region of the south geomagnetic pole. Meteorological investigations there have shown that the atmospheric pressure in the Antarctic is lowered in the course of the whole year, during which its yearly course is opposite to the yearly course in the northern hemisphere, and in winter the pressure is lower than in summer. The troposphere in the Antarctic is colder in summer and winter than in the Arctic in these same latitudes. In contrast to the Arctic, the stratosphere in the Antarctic is higher in winter than in summer. The average yearly humidity of the air in the vicinity of Mirnyy is 67 percent, falling to 26 percent in the winter. According to the distance traveled into the interior of the continent, the temperature drops. The minimum temperature registered at Pionerskaya was near 70 degrees below zero. Winds have been recorded at 60 meters per second at Oazis. The average temperature at Vostok I during July 1957 was minus 58 degrees, and it rarely dropped below 70 degrees centigrade.

Glaciological investigations showed that in the region of Pionerskaya station, 375 kilometers from the coast, the bottom of the glacier is several hundred meters below sea level. The continental ice there is more than 3,000 meters thick. The discovery of only separate parts of land rising above sea level near the shore raises doubts as to existing ideas concerning Antarctica as a single continent. In any case it presents the basis for a revision of notions concerning the size of this continent if only in its eastern part.

Many oceanological investigations are under way in the Soviet Union. The expeditionary ships Ob' and Lena have already made important investigations in subantarctic waters. In the Pacific ocean the Vityaz has gathered much information on the bottom profile of the ocean. Its most notable discovery was a submarine mountain 3-4 kilometers higher than the ocean bed. In the Mariana depression a record depth of 10,900 meters was registered.

A new oceanographic ship, the Mikhail Lomonosov, began investigations in the north Atlantic in February 1958.

Extensive glaciological investigations under the IGY are conducted in all the main glacier areas of the USSR. Among these are the Fedchenko glacier in the Pamirs, the glacier fields in Novaya Zemlya, and the glacier and ice fields in the region of the Suntar-Khayata.

A soviet astrophysical expedition under the direction of Academician Fesenkova has returned to the USSR after conducting observations on zodiacal light in Egypt together with Egyptian scientists. The region selected was the Nubian Desert, since it is there that zodiacal light lies perpendicular to the horizon, substantially facilitating observations. Similar observations were conducted simultaneously in Alma-Ata.

Soviet solar observatories continuously conduct observations on the state of the Sun. The best-known of these is the Crimean Astrophysical Observatory, which reports its data on solar activity to the Soviet Center of World Days, which is connected with the centers in Paris, Tokyo, and Washington. This same center notifies all Soviet observatories which conduct observations for complex magnetic phenomena, of the ionosphere, the aurorae, cosmic rays, the Earth's magnetic field, and earth currents, of the probable coming of the so-called world intervals.

"It is known that in accordance with the obligations accepted under the IGY program artificial earth satellites were launched in the Soviet Union. Thanks to these sputniks, scientists throughout the whole world were given the opportunity of obtaining information on the nature of various geophysical phenomena in the upper atmosphere from heretofore inaccessible altitudes. It is difficult to overestimate the value of the scientific data obtained in connection with the launching of the Soviet artificial earth satellites. Thus, for example, observations on the propagation of radio waves radiated from the sputnik are of great value. Up to the present the principal information concerning the ionosphere was obtained as a result of studying radio waves sent from the Earth and reflected from the ionospheric region lying below the zone of maximum ionization of the ionospheric layers. The launching of the sputnik made it possible to receive radio signals over a long period of two different frequencies from parts of the ionosphere not previously accessible for long-period observation lying above the maximum ionization, and, probably, the ionosphere as a whole.

Observations during the flight of the sputnik carrying the dog Laika show that the condition of an animal during orbital flight remains satisfactory. There is no doubt that the investigations conducted are a significant contribution to the successful realization of interplanetary flights and will serve as the basis for developing the means of ensuring the safety of man's flights in cosmic space.

Completely new possibilities of observations during primary cosmic radiations are presented with the use of sputniks. Moving at a speed of 8 kilometers per second, the sputnik through a very short interval of time passes from one latitude to another and makes it possible to study the very important and interesting latitudinal effect of cosmic radiation, that is, the variation of the number of particles with geomagnetic latitude. The determined latitudinal effect of this radiation makes it

possible to study the distribution of cosmic particles according to energy. The distribution of cosmic particles according to energy gives an indirect indication concerning the processes originating at great distances from the Earth and also from the solar system. The preliminary processing of data concerning cosmic rays transmitted from the second sputnik showed that both the instruments functioned normally. The relationship between the number of particles of cosmic radiation and the geomagnetic latitude was apparent. All the data obtained with the sputniks are being processed and in time will be sent to IGY world data centers.

Material on observations already has begun to arrive in Soviet IGY data centers from stations in the Soviet Union as well as from many foreign countries. The exchange of material between centers has also begun.

A consideration of the problems concerning the processing of IGY results will be made by an assembly of CSAGI (Special Committee for the IGY) being called this year in August in Moscow. Taking part in this assembly will be a wide circle of scientists, specialists in various fields of geophysics, and representatives of all countries participating in the IGY.

The period of preparation for the IGY and its first months have already shown that the noble aims of the IGY are capable of arousing great forces. The IGY is a lever, with the aid of which the study of the Antarctic and the study of the course of planetary processes, the knowledge of which is necessary to solve the knotty problems of modern geophysics, were undertaken. Finally, within the frame of the IGY artificial earth satellites will be launched, opening to scientists new, unknown worlds. There is no doubt that the IGY opens new borders not only in the history of the development of geophysics, but also in the history of international scientific cooperation in general. (Vil'nyus, Sovetskaya Litva, 6 Mar 58)

II. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Third Sputnik Launching May Have Had Some Failures

The West Berlin newspaper Der Kurier has implied that the USSR reportedly tried to launch a third sputnik before 1 May but that the attempt apparently failed or was postponed. The newspaper has published a photographic copy of a cover of the East Berlin review Neue Berliner Illustrierte greeting the "launching of Sputnik III into the universe." According to Der Kurier, the cover was printed on 13 April for the 1 May issue of Neue Berliner Illustrierte, and shortly thereafter, it was seized

on orders of the governmental press service. Der Kurier added that this [the seizure] would seem to confirm that the launching of Sputnik III was to have taken place before 1 May but that it must have been postponed.
(Brussels, La Libre Belgique, 2 May 58)

Sputnik and the Geoid

A popular science article, titled "Geodesist of the Sky," by Ye. Saparina, includes the following statements:

"We know that the Earth is not a true sphere, but the exact figure of our planet has not been determined. With the launching of artificial earth satellites, this problem has once more become the center of attraction for scientists.

"Gravity, in general, depends on the distribution of the Earth's core and on the attracting masses at its surface. The layers of the Earth's core, however, vary, and the weight of the crust as a whole, compared with the Earth's core, has a different density and thus attracts bodies to a varying degree.

"The gravimetric survey of the territory of the USSR and surrounding seas was begun in 1932, and the force of gravity has been determined for more than 20,000 points. Gravimetric surveys are included in the program of the IGY, and will be carried out at difficultly accessible places, including the Antarctic.

"By measuring the force of gravity at various geographical locations, it is possible to determine the form of the earth -- the geoid. A geoid cannot be described graphically; there is no such geometric figure. One essential requirement which the geoid must meet is that the plumb line at any point must be perpendicular to the surface of the geoid. This is about all that is known about it.

"With the aid of angular and gravitational measurements, the Soviet geodesist, Zhongolovich, was successful in determining over 60 constants (actually infinite in number) which characterize the figure of the Earth. With the aid of the Regular moon it is possible to detect only two such values -- the degree of flattening [ellipticity] and its size. Other irregularities of the Earth have no influence on the Moon. But now the sputnik is detecting everything.

"In this regard, the polar sputnik, that is, the Soviet satellite, is more convenient, since it flies around a greater surface of the Earth. The motion of the equatorial sputnik tells us only of the equatorial irregularity.

"At first glance it seems strange: How can this satellite, located outside the Earth, be able to say what is happening inside our planet? But this is true. The satellite moves in the Earth's gravitational field and very delicately reacts to all irregularities of this field. The satellite, for example, is able to 'sense' that under it are located deposits of heavy iron, and to 'distinguish' rock from the lighter water of the ocean.

"By studying the motion of the sputnik (single 'local' disturbances of its orbit), we are able, so to speak, to probe the gravitational field of the Earth, to determine its 'concentrations' and its 'gaps,' that is, to know where deposits of great density are located within the Earth and to what depth and distance they extend.

"In order to learn of the internal structure of the Earth, we need only determine carefully the coordinates of the sputnik with an accuracy of up to dozens of meters. In the territory of the USSR there are over 60 special observation points, each of which has 20-30 observers. In addition, there are a number of stations for more accurate photographic observations." (Znaniye-Sila, No 3, Mar 58, pp 30-34)

III. UPPER ATMOSPHERE

Television Techniques in Astronomy

The use of television techniques in astronomical practice as a means of decreasing the exposure time in photographing heavenly bodies is discussed by N. F. Kuprevich, Candidate of Physicomathematical Sciences, Main Astronomical Observatory, Academy of Sciences USSR (Pulkovo), in an article which recently appeared in a Soviet periodical.

In astronomical practice it has long been realized that a reduction in exposure time during the photographing of celestial objects always improves the quality of the picture, since by doing so the effect of the Earth's atmosphere (which is never at rest) on the picture is decreased. The motion of the air masses causes various optical distortions of the images of distant astronomical objects.

Long exposures give washed-out pictures in which details are lost. In short exposures, about one fiftieth of a second, very sharp pictures have been obtained in various occasional photographs. The use of instantaneous photography is not always possible. Its drawback is the comparatively small illumination with which astronomy must deal. To overcome this it is natural to turn to increasing the size of the telescope. This is a costly and technically difficult procedure. In the most modern telescopes concave mirrors are used. With the level of engineering today, mirrors of about 5 meters can be considered the largest feasible. This is explained by the difficulty of making such large mirrors and by the fact that the great size of the mirror causes it to bend under its own weight in the different positions of the instrument, which in turn causes distortion of the image.

The most widely used telescopes have an aperture of 0.5-1.0 meter. Since the sensitivity of photoplates has not been appreciably increased in the last few years, it is necessary to seek another solution to the problem of shortening the exposure time during the photographing of astronomical objects.

A photocathode photoelement is approximately 100 times more sensitive than a photoplate. Therefore, using it as a receiver of light only one hundredth of the usual exposure time is required. However, use of the photocathode for obtaining images is not as simple as would be the use of the photoplate. The specific properties of the photocathode find application either in the so-called electron-optical converter or in the transmitting television tube used with appropriate apparatus. Here the photocathode, in comparison with the photoplate, can be considered a light intensifier. In this case the use of the photocathode has the effect of increasing the aperture of the telescope. Thus the use of the electron-optical converter with a 0.5-meter-diameter telescope is equivalent to

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the usual telescope having a 5-meter diameter. However, the gain here will be in raising the sensitivity and not in increasing the resolving power (the optical diameter is not changed).

An image obtained on the screen of such an electron-optical converter when photographed with a special light-intensifying objective results in the reduction of the exposure time to from one fourth to one sixth.

Use of a converter with a photocathode which is sensitive to infrared rays makes it possible to see objects otherwise invisible to the eye. Using the converter in photographing the sky led to the discovery of many new objects previously undiscovered because of the low sensitivity of photoplate emulsions to this field of the spectrum. For increasing the brightness it is possible to use several converters, projecting an image from the screen of the first converter to the screen of the second, and so on. Sometimes two converters are joined in one two-step block. In such a block the screen of the first converter is separated from the photocathode of the second converter by a glass plate several tenths or thousandths of a millimeter thick. The over-all intensification given by such a block is more than the intensification of brightness by using the preceding system. Under favorable conditions photographing from a screen can give a brightness 100-130 times greater.

Another method of increasing the brightness of an image is by television techniques. The use of television apparatus has a number of advantages. First, it permits transmitting an image from a telescope for a great distance, which in some cases is essential. Second, its use makes it possible to obtain a much larger image than that originally projected on the photocathode of the transmitting tube. Finally, it permits smooth regulation of the size, contrast, and brightness of the image. The shortcomings of the television method are due to the great complexity of the equipment.

The basic part of a television apparatus, the transmitting tube, transforms a luminous image into electrical signals. These electrical signals are conveyed through appropriate apparatus to a receiving tube, the kinescope, where they are converted into a brighter image. The principle of transmitting an image from a photocathode on a receiver screen, on which the image is studied, differs in these two methods. In the electron-optical converter the electron image is wholly projected on the screen, where it is also transformed into a visible image. In television apparatus the transmission of the image occurs in succession, from point to point. Here the image unfolds in a horizontal direction according to lines, and in a vertical direction according to squares.

In television technique several types of transmitting tubes having different light characteristics and possessing different sensitivity are used. In astronomical practice for photographing, at exposures of one fiftieth of a second, sufficiently bright objects, such as the Moon and Mars, the most suitable type of tube appears to be the "Ortikon" with an image converter.

A television apparatus has been developed and constructed in the Pulkovo Main Astronomical Observatory especially for photographing celestial objects from a telescope screen. The electrical system of the apparatus is somewhat more simplified than the systems used in television centers. The installation provides a definition of the usual television standard of 625 lines. Experiments photographing the surface of the Moon were made on the horizontal solar telescope in the Pulkovo observatory in the fall of 1956.

The horizontal telescope is located in a large pavilion. There is no actual telescope tube; a room 50 meters long fulfills this role. Mirrors, which can be shifted along special rails for focusing the optical image on suitable light receivers, are mounted on bases.

The light from a celestial object, in this case the Moon, falls initially on the plane mirror of a target follower, which is equipped with a clock mechanism. The purpose of the target follower is to follow the shifting object in the celestial sphere in the course of the daily rotation of the Earth. Further, the rays of light fall on an additional mirror, also flat, and are reflected from it onto the concave mirror of the telescope. The diameter of the mirror is 500 millimeters, and the focal distance, 16 meters. The diameter of the image of Moon in the focus of the mirror is 14.5 centimeters. For obtaining an image larger in diameter, a supplementary mirror with a very small convexity can be used. Both these mirrors together have a focal distance of 56 meters. The diameter of the Moon's image attains 500 millimeters (second focus). A television tube can be located at either of the two points, at the focal distances of 16 or 57 meters, correspondingly. Since the aperture of the transmitting tube (photocathode) is 28 x 28 millimeters and of the receiving tube is 180 x 240 millimeters, then on the television screen the Moon's image is 6.5 times greater, and on it a part of the lunar surface is seen which is equal to a diameter of 940 millimeters for the first focus and 3.3 meters for the second.

The image from the television screen is photographed on motion picture film by a small camera. An electronic synchronic shutter is used during photographing which provides an accurate exposure of one fiftieth of a second and permits making only one frame. Here during the introduction of the special starting impulse, the synchronous shutter controls the brightness of the receiving tube screen. Before photographing the electronic rays of the kinescope "are locked," and the image on the screen is

absent. From the moment of the beginning of the frame, i.e., with the appearance of the first lines, the rays are "unlocked," and the image appears on the televisor screen. For photographing the following frame it is necessary to introduce the starting impulse again. It is practically impossible to obtain good photographs without a synchronous shutter, since it is not possible to open the shutter exactly at the moment of the beginning of the frame and to close it at its end. A small error in timing causes the appearance of white or dark streaks on the photograph. Satisfactory photographing of a screen can be obtained by increasing the exposure time by only one fifth of a second. In this case several frames are photographed and superimposed, making the streaks become almost invisible. This method is excluded from the operating conditions in use. It is also impossible to reduce the exposure time, for instance, down to one hundredth of a second, despite the sufficiently bright image on the screen. With an exposure less than the time of the scanning of a frame, the photograph will yield only part of the lines, and consequently, only part of the image. For shortening the exposure time it is necessary to shorten the scanning time of the frame. However, this is not always possible for fixed apparatus. With an image of the Moon, 14.5 centimeters in diameter, the illumination in the first quarter will not exceed 0.05 lux, and direct photographing with an exposure of one fiftieth of a second gives a negative with a hardly noticeable black saturation.

The illumination of an image on a television screen reaches 30-40 luxes. This permits obtaining contrasting negatives during the photographing of a television screen with the usual objective with a relative opening of 1:3.5.

Reference is made to the use of television techniques in astronomy in other countries. Experiments in this direction which were conducted in Cambridge, England, and which gave favorable results are cited.

At present, work has begun on the adaptation of methods of electronic intensification of the brightness of astronomical pictures. Undoubtedly, future work in this direction greatly increases the possibility of using existing small-size telescopes. (Priroda, No 3, Mar 58, pp 50-54)

Soviet Observatories to be Provided With Larger Telescopes

The Presidium of the Academy of Sciences USSR, taking note of the insufficiency of large telescopes in Soviet observatories and the ever-increasing need for such instruments, has taken measures to overcome this shortcoming.

The most important problems of the structure of the Milky Way and other galactic systems, as well as the new problems which have arisen as the result of the launching of artificial earth satellites and future problems of interplanetary vehicles or rockets require powerful light-gathering telescopes for their solution.

In this connection, the Presidium created a special laboratory in the system of the Academy of Sciences USSR for designing and organizing the construction of a reflecting telescope with a speculum 6 meters in diameter. This is in addition to a reflector with a 2.6 meter aperture being built for the Krimean observatory. This laboratory will conduct experimental testing of new ideas and construction principles of Soviet telescope assemblies, the grinding and polishing of the basic optical units (including the main 6 meter mirror), and the selection of the most favorable (in an astroclimatic sense) point for the erection of the telescope.

Up to the organization of the laboratory, work on the large telescope will be conducted by the Main Astronomical Observatory.

The Presidium engaged the Institute of Electromechanics to develop a small photoguide and apparatus for photoelectrically compensating the deflections of the telescope tube and for providing automatization of special observational apparatus to conduct specific work according to the tasks of the Crimean Astrophysical Observatory.

The Division of Technical Sciences must provide for the development of work on the automatization of instruments used in astrophysical investigations in their own plans, and the Division of Physicomathematical Sciences must provide for the continuation of the work on the large telescope in the Main Astronomical Observatory, the expansion of the Department of Astronomical Instruments of the Crimean Astrophysical Observatory and the creation of a laboratory (groups) for electron photography. (Vestnik Akademii Nauk SSSR, No 3, Mar 58, p 106)

Role of Thermal Fields in Jet Stream Evolution

The relationship between changes in the temperature field of the troposphere and the evolution of jet streams is considered in an article, by K. F. Ugarova. A total of 11 cases of jet streams located for the most part over the european territory of the USSR in the cold months (October-April) of 1954-1956 are analyzed. Selection of the cases was based on a value exceeding 100 kilometers per hour at the 300 mb level.

Of these 11 cases, six had sharp deformations of the jet stream accompanied by the formation of high-altitude troughs, while in the remaining five, the deformations were small. Variations in the intensity of the jet streams were studied at the 300 mb level, as this surface is the most representative in the determination of the location and intensity of the axis of such a flow.

It was found that a variation in the intensity of the jet stream and a change in the concentration of temperature contrasts in the troposphere are closely interconnected. Changes of the temperature field of the troposphere in the jet stream region substantially effect not only the horizontal transfer but the vertical movements as well. In addition, the vertical movements do not form any single nucleus of circulation on the extent of the jet stream as a whole. The character of the vertical circulation across the jet stream changes in relation to the changes in the circulation processes. (Meteorologiya i Gidrologiya, No 1, Jan 58, pp 22-27)

Rumanian Radio Sounding Reaches 30,000 Meters

Radio sounding done by Rumanian meteorological authorities in connection with research for the IGY has recently attained heights which were not reached in earlier years. Equipment imported from the USSR for this purpose and installed at Bucharest-Baneasa and at Cluj, has proved of superior quality. This year, radio waves reached the following altitudes: 5 January, 30,508 meters; 25 January, 31,519 meters; 10 February, 30,308 meters; 29 March, 30,350 meters; and 5 April, 30,787 meters. (Bucharest, Rominia Libera, 10 Apr 58, p 2)

IV. OCEANOGRAPHY

Soviet Oceanographic Expeditions

The scientific exploratory fleet of the Academy of Sciences USSR now numbers about 30 different ships and is widely engaged in the work of the IGY program. In an interview given to a Soviet newspaper, Chief Maritime Inspector S. I. Ushakov, a captain of long experience, gave some information on the expeditions these ships are engaged in.

The flagship of the fleet, the Vityaz, under the command of Capt I. V. Sergeyev is the next to embark on a scientific voyage under the IGY program. This spring, the course of the ship will be from north to south through the Pacific Ocean from the latitude of Vladivostok down to the shores of New Guinea. Approximately every 60 miles, the scientific complement of the expedition under the direction of V. P. Perelin, candidate of geographical sciences, will conduct complex oceanographic investigations,

obtaining important data concerning the temperature, chemical content, and physical properties of the ocean waters at different depths. Data on the climate and the weather, soils lying on the bottom of the ocean, and ocean currents also will be collected.

The return route of the Vityaz to Vladivostok, where the ship will arrive in June, will pass near the Philippine archipelago and the islands of Japan. The equator will be crossed eight times during this trip. In the fall, the ship will embark on another voyage and will conduct scientific investigations throughout the Pacific Ocean, this time in a latitudinal direction.

The new expeditionary ship of the Academy of Sciences USSR, the Mikhail Lomonosov, commanded by V. S. Rudnykh, will work in the Atlantic in the first part of the year. Prior to May, the staff of the expedition, under A. A. Ivanov, Doctor of Physicomathematical Sciences, concluded large oceanographic investigations from the Iberian peninsula to the shores of Newfoundland. From there, the ship will proceed to the region between Iceland and Scotland, where the Gulf Stream meets the waters entering from the central Arctic basin.

In the waters adjoining the glacial shores of Antarctica, the Ob' has successfully completed its work. Now it is going to the Chilean port of Valparaiso, from whence it will sail through Drake's Passage at the tip of South America and up the coast, stopping for a visit in Buenos Aires. From there, it will cross the Atlantic arriving in the USSR in July.

The Sevastopol Biological Station of the Academy of Sciences USSR, the oldest scientific marine institution in the Soviet Union, will organize an expedition on the ship Academician Kovalevskiy this summer. A large group of Soviet scientists under Professor V. A. Vodyanitskiy, Corresponding Member of the Academy of Sciences Ukranian SSR and director of the station, will conduct much complex work in the Black Sea near the shores of Rumania and Bulgaria and undertake a scientific voyage in the Adriatic Sea.

Investigation of the fish resources of the Barents Sea will be performed by an expedition from the Murmansk Biological Station, Academy of Sciences USSR, on the newly outfitted ship, Professor Deryugin. (Moscow, Izvestiya, 1 May 58)

Ob' in South Pacific

A radio report from V. Tkachev, first mate on the Soviet diesel-electric expeditionary ship Ob', locates the ship some 600 miles south of Easter Island in the Pacific. (Izvestiya, 5 May 58)

Polish IGY Expedition to Spitsbergen

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A 20-member Polish scientific expedition headed by Prof Aleksandrev Kosiba, meteorologist and glaciologist of the University of Wroclaw, is scheduled to leave for Spitsbergen via Tromsoe, Norway, on 6 June.

Professor Kosiba recently spent 3 weeks in Oslo to consult with the Polar Institute, the Meteorological Institute, and Norwegian geographers and geologists on the latest results of scientific explorations in Spitsbergen. (Oslo, Aftenposten (PM edition), 29 Apr 58)

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