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PLEASE NOTE

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SOVIET BLOC INTERNATIONAL GEOPHYSICAL YEAR INFORMATION

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I. GENERAL

Scientists Discuss International Relations in Moscow

The editors of the journal Mezhdunarodnaya Zhizn' organized a discussion on 24 February 1958 in Moscow on the theme "Problems of International Relations in the Light of the Discoveries of Soviet Science." Leading Soviet scientists, social activists and journalists participated. Letters which were sent to the editors by Kuo Mo-jo, president of the Academia Sinica, Polish Academician Jan Dembowski, English philosopher Bertrand Russell and other foreign workers in science, which expressed their viewpoint on the problems being discussed, were read. (Moscow, Izvestiya, 25 Feb 58)

Czechoslovak Gravimetric, Upper Atmosphere, and Satellite Tracking Efforts

Josef Novak, chairman of the Czechoslovak commission for IGY made the following statements about Czechoslovak participation in IGY in an interview with Vecerni Praha, published in Prague.

Czechoslovakia is participating in all fields of research except on glaciers, icebergs, and oceans. During the period 1 July 1957 to 31 December 1957, 310 solar eruptions were observed and measured and 71 solar radio emissions were recorded by radiotelescope on the 56 centimeter wave length. This information was sent to Moscow, Paris, the United States, and Australia.

Observations of the earth satellites began on 5 October 1957 and since that time the carrier rocket has been observed optically 22 times, the first satellite 4 times and the second satellite 24 times, not counting other not completely reliable observations. Thirty seven photographs were taken of the rocket, one of the first satellite, and 3 of the second. Data on visual and radio observations agreed very well.

At present, Czechoslovak scientists are devoting special attention to cosmic radiation. Apparatus have been installed in Prague and on Lomnicky Peak. After making experimental measurements for 6 months they began sending data to the regional center in Moscow as of 1 January 1958. The world is interested in these measurements, because the Czechoslovak stations in the High Tatras are among the highest in the world.

Czechoslovakia will also support a gravimetry program. In addition to measurements now being carried out at a depth of 1,000 meters, Czechoslovaks want to take measurements at 1,300 meters with very sensitive oscillation instruments. These would be the deepest measurements made during the IGY. (Prague, Vecerni Praha, 22 Jan 58)

Hungarians Compute Gauss-Kruger Coordinates

The geodetic laboratory has completed the computation of the Gauss-Kruger coordinates relating to the Krassovskiy ellipsoid. The geophysical research laboratory has continued its investigation of telluric currents in relation to exploration for minerals. (Budapest, Muszaki Elet, 9 Jan 58)

II. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Swedish Expert Discounts Soviet "Phantom" Fuel Use

Engr Bengt Bergqvist, research chief of the Swedish Interplanetary Society, said in a speech given on 25 February to the Technical Physicists Society in Stockholm that, with regard to the fuels used for Sputnik, Vanguard, and Explorer, science is not too far removed from the V-2 rocket, and that all the talk of a Soviet phantom fuel in the sputnik rocket was incorrect. (Stockholm, Svenska Dagbladet, 26 Feb 58)

Soviets to Display Sputnik II Model in Japan

A model of the second Soviet artificial earth satellite will go on display at the International Exhibit in Osaka, Japan.

A Tass photograph (1) shows artist-modelmaker D. Golubchikov dabbing on the final touches to a full scale cutaway model of Sputnik II. (Leningradskaya Pravda, 5 Feb 58)

(1) Photo available in source, p 1.

Solar Studies and Satellite Observations in Azerbaydzhan SSR

The Sector of Astrophysics of the Academy of Sciences Azerbaydzhan SSR and the Azerbaydzhan State University imeni S. M. Kirov (AGU) are participating in investigations for the IGY. Information on some of these operations is given in a newspaper article by G. F. Sultanov, director of the Sector of Astrophysics, and R. Z. Guseynov, chief of the astronomical station of the university.

Solar observations for the IGY have been conducted by the Sector of Astrophysics since 1 July 1957. These are being made in a mountain station in Shemakhinskiy Rayon, where favorable astronomical conditions make it possible to obtain valuable data and where construction of a large astrophysical observatory will soon begin. Of particular interest in the studies of the station are the chromosphere flares which consist of unusual outbursts electromagnetic processes which cause great flows of solar corpuscles, and electromagnetic processes which affect weather and climate. The observations are being made with a chromosphere-photosphere telescope, and regular motion pictures are made of these chromosphere flares and also of the solar disk.

At the request of scientists for the Crimean Astrophysical Observatory who visited the mountain station of the Sector of Astrophysics, one copy of the daily photoheliograms will be sent to the Crimea for the study of the magnetic fields of sunspots.

Observations of the first artificial satellite were conducted from the moment of its launching at the specially organized astronomical station of the Azerbaydzhan university. It was required to determine the position of the satellite at the moment of its passing. The observers consisted of instructors, laboratory workers and students of the university who worked with astronomical telescopes and other physical instruments installed in the station. The satellite observation assignment for 1957 was successfully completed, and three passes of the second satellite were observed in the first half of December.

A new problem has been placed before the astronomical station of the university -- photographic observation of the satellite. Prior observations were visual, and the accuracy was not sufficient. A complex of specialized instruments consisting of a camera for photographing the satellite and background stars, a chronograph for registering the exact time, and an electrophotometer for measuring brightness variations were constructed for more accurate determination of satellite position. (Baku, Bakinskiy Rabochiy, 5 Feb 58)

Sputnik II Continues to Perform as Data Accumulate

The Izvestiya communique of 16 February 1958 on satellite ephemeris had this to say about Sputnik II: CPYRGHT

At 0900 Moscow time on 16 February Sputnik II completed its 1,500th revolution around the Earth.

Since the launching of Sputnik II, 105 days have passed. From the moment of its orbiting, a vast amount of material of radio and optical observations of great scientific value has accumulated. This material continues to be accumulated each day. Current processing of the data of measurements indicates the excellent coincidence of actual and calculated parameters of the satellite's orbit. This indicates the high accuracy of the measurements and the forecast of the movements of the satellite on the basis of the measurements processed.

Optical observations are being conducted by more than 80 astronomical stations in the Soviet Union and more than 50 astronomical stations in Europe, Asia, and South and North America.

The measurements of greatest value regularly come from observatories and astronomical stations located in Pulkovo, Arkhangel'sk, Abastumani, Yakutsk, Vologda, Leningrad, Moscow, and Irkutsk. Much valuable material is received from astronomical stations in Czechoslovakia, China, Bulgaria, Poland, Yugoslavia, the Netherlands, Finland, and Chile.

Since the moment of orbiting, Sputnik II has traveled a distance equal to 67,555,000 km, which is 1.18 times the distance to Mars during the time when it is closest to Earth and more than 175 times the distance from Earth to the Moon. The revolution period of Sputnik II has changed by 6.2 min, and at present it takes 97.5 min for a complete revolution, which is 1.3 min more than the revolution period of Sputnik I at the time of its entry into orbit.

The daily change in the revolution period at present is about 4.7 sec. In the first days of its orbiting the variation was about 2 sec. The maximum altitude of the orbit has decreased by 590 km and is currently 1,080 km.

In clear weather on 16 February, Sputnik II may be observed with the naked eye at sunrise from 54° to 65° north latitude and from 46° to 63° south latitude.

On 17 February, Sputnik II will pass northwest of Moscow at 0616 in a southwest to northeast direction. (Moscow, Izvestiya, 16 Feb 58)

CPYRGHT

Dobronravov Reviews Sputniks I and II

V. V Dobronravov, professor and Doctor of Physicomathematical Sciences and deputy chairman for science of the Astronautics Section of the Central Aero Club imeni V. P. Chkalov, presents an interesting review of both Soviet artificial earth satellites as follows:

The entire world is following with exceptional attention the extremely remarkable events in science and engineering which have taken place recently in the USSR. Soviet scientists, engineers, technicians, and workers constructed for the first time in the world an aircraft capable of operating for a prolonged length of time and reaching interplanetary space. Such aircraft are the intercontinental ballistic rockets which were successfully tested in August 1957, and also the Soviet artificial earth satellites.

The first Soviet artificial earth satellite was successfully launched on 4 October 1957, and the second, significantly improved, on 3 November 1957. The ballistic rocket and the first satellite were carried to distances from the Earth approaching 1,000 kilometers. The farthest point of the orbit of Sputnik II was at a distance of 1,700 kilometers from the Earth.

These events opened up a new era in history -- the era of the conquest of interplanetary space by man. From this viewpoint, the recent achievements of Soviet science and engineering may be compared with such events as the invention of the steam engine, the invention of radiotelegraphy by A. S. Popov, and the utilization of intranuclear energy.

On the other side, the achievements of Soviet science and engineering attest to the very high scientific and engineering level achieved in the USSR. In the field of rocket engineering the Soviet Union has surpassed all countries, including even the US. This, however, is not only in the field of rocket engineering; its development is connected intimately with successes in all fields of the exact and natural sciences and with progress in various branches of industry and engineering.

The achievements of Soviet society logically and naturally proceed from the previous course of growth for the entire country. Under the direction of the Communist Party and the Soviet government vast and intensive work was done in converting the former backward Czarist Russia into an advanced industrial country with industrial and technical might. Exclusive attention was given to the development of science. A number of scientific research institutions -- institutes, laboratories, design bureaus, etc. -- were organized in the country. The Academy of Sciences USSR was transformed into the major scientific center directing the scientific life of the country. The network of higher educational institutions was extraordinarily expanded.

It should be noted that the Soviet Union is the home of theoretical rocket dynamics and astronautics. The bases of these sciences were by Russian scientists -- I. V. Meshcherskiy and, chiefly, K. E. Tsiolkovskiy. The 100th anniversary of the birth of K. E. Tsiolkovskiy was celebrated widely in September 1957. His legacy was deeply developed in many scientific research institutions and higher educational institutions.

All these factors indicated resulted in the fact that launching of the first artificial earth satellite in the world was conducted in the Soviet Union.

The first Soviet artificial earth satellite is a small spherically shaped body with a diameter of 58 centimeters. The satellite moves around the Earth in an elliptic curve. A rocket-carrier was used for placing the satellite in its orbit. The rocket moved in the beginning according to a transitional trajectory the rectilinear initial section of which was perpendicular to the surface of the Earth and achieved an altitude to 80 kilometers, that is passed through the densest layers of the atmosphere. Continuing to gain altitude, the rocket turned according to plan, and at the end of the transitional trajectory at a distance of several hundred kilometers from the Earth, the satellite and protective cone were separated from the nose section of the rocket with the aid of ejecting devices.

The final velocity attained by the satellite was equal to approximately 8 km/sec (the first cosmic velocity), and the satellite began to move under the action of the Earth's gravity alone. The farthest peak of the ellipse (apogee) was originally at a distance of approximately 1,000 kilometers from the South Pole side of the Earth.

The plane of the orbit of Sputnik I was inclined to the equatorial plane of the Earth at an angle of 65°. Such an orbit permits the satellite to pass over all parts of the territory of the USSR.

It is necessary also to explain the motion of the Earth around the general center of the mass of a system of two bodies -- the Earth and the Moon. The center of the mass of this system is within the Earth at a distance of 4,500 kilometers from its center. The Earth slowly rolls over this point. During the movement of the satellite in a selected orbit, this movement of the Earth will influence it less than in the case of movement of the satellite in any other orbit.

Of great importance and inestimable service were electronic computers with whose aid all elements of the transitional and stationary trajectories of the satellite were successfully calculated with great accuracy. The slightest error in the calculations of the trajectory program of control during movement in the transitional trajectory could lead to a mishap in the launching of the satellite.

The design of the satellite antenna is of special interest. Not one foreign artificial satellite project contains similar original parts in the form of suspended antenna rods. The practicality of such a technical idea indicates that in the future, both on a satellite and on interplanetary ships, similar devices which automatically slide in and out, for example, in landing or braking, may be used.

During the launching of the first Soviet satellite, one event occurred: the rocket-carrier of the satellite at the end of operation of its motors attained a velocity sufficient enough for it to revolve as a satellite of Earth and thus, as a satellite, began moving in a closed orbit around the Earth. Originally, the orbits of the satellite and the rocket-carrier were close together. Subsequently, the rocket-carrier began to experience great braking from the surrounding material medium, even though it was highly rarefied at those altitudes, where the movement of both bodies occurred; therefore, the rocket-carrier began to drop more quickly than the satellite under the influence of the Earth's gravity.

On 3 November 1957, one month after the launching of the first satellite, the whole world learned of the latest brilliant achievement of the Soviet government: the second Soviet earth satellite, which was of significantly greater size and weight than the first satellite, was launched.

It should be noted that Sputnik I astonished foreign scientists with its weight, which was 83.6 kilograms, for such small dimensions. In such a manner the workers of the Soviet instrument building, electrical, and radio engineering industry succeeded in equipping Sputnik I with comparatively powerful small-size apparatus.

The second Soviet artificial earth satellite was the final stage of a multistage rocket. Naturally, in the compartments of such a body, it was possible to mount significantly larger sources of electrical energy and more powerful apparatus not only for radio communications with the Earth but also for making various scientific observations.

Moreover, the first living traveler in the cosmos -- a dog, housed in a special hermetically sealed container -- was placed in Sputnik II. Within the container regeneration and conditioning of air were provided as well as a supply of food. To the body of the dog were attached instruments which recorded the functions of the organism: the work of the heart, blood pressure, respiration, etc.

The results of measurements being transmitted by radio to the Earth will be highly useful for the organization in the future of interplanetary flights with human beings.

The useful weight of the equipment of Sputnik II, including the container with the dog (excluding the rocket body), was 508.3 kilograms. The equipment consisted of an apparatus for investigating solar emissions in the short-wave ultraviolet, and X-ray regions of the spectrum; apparatus for the study of cosmic rays; and telemetering apparatus for transmission of measurement data to the Earth.

Sputnik II was equipped with two radio transmitters operating on frequencies of 40.002 Mc and 20.005 Mc (with a wave length of about 7.5 and 15 meters, respectively).

The signals of the radio transmitter on the 20.005-Mc frequency were in the form of telegraphic pulses with a duration of about 0.3 second with a pause of the same duration. The 40.002-Mc transmitter operated continuously.

During launching Sputnik II achieved a much higher velocity than Sputnik I; as a result, its orbit was at a greater distance from the Earth than the orbit of Sputnik I. The inclination of the orbit of Sputnik II, just as in the case of Sputnik I, was 65° to the equatorial plane.

With the aid of instruments mounted on satellites, a number of observations from a study of the upper, extremely rarefied layers of the atmosphere, investigations of pressure of gases, etc., may be conducted. Various interesting facts can be obtained, not only with the aid of instruments mounted on the satellites, but also by a study of the forms of the satellite orbit and its changes as it approaches the denser layers of the atmosphere.

The basic content of observations will be related to the study of the sun and cosmic rays. Extremely favorable conditions for making such observations exist outside of the atmosphere. A detailed investigation of the ultraviolet portion of the solar spectrum, X-radiation, and electron emission is planned. The intensity of corpuscular solar radiation, its effect on the change in the Earth's magnetic field, disturbances in the ionosphere, the nature of northern lights, the degree of penetration of particles in the atmosphere, etc., will be clarified.

Interesting results are anticipated from the study of the physical properties of the ionosphere: clarification of the degree of ion concentration and its change with altitude. Observation of the passage of radio waves in the ionosphere, not only radiated by the radio transmitter of the satellite itself but also reflected radio waves sent from the Earth, will be highly effective.

Electrical currents being originated by short-period changes in the Earth's magnetic field will be investigated. With other satellites the hypothesis of the existence of circular flows in the aurora zone and in areas situated at the equator will be verified. These data will be very interesting for the physics of electrical phenomena in general.

Especially interesting will be the observations on primary cosmic rays. As is known, in the composition of cosmic rays which penetrate the Earth from the depths of the universe, there are particles which are principally of the same nature as intranuclear particles in the atom. In particular, among the cosmic particles may be found protons, helium nuclei, mesons of various types, etc. Cosmic particles penetrating the Earth with highly decreased energy and in small quantity are absorbed in a large degree by the Earth's atmosphere. Outside of the atmosphere cosmic particles should be observed in their natural state -- with great velocities and high energy.

Instruments mounted on the satellite (particle counters, photo-emulsion devices, etc.) can record the parameters of particles, determine their energies, and fix their collision, decay, manifestation of the effects of these new particles, etc.

New, interesting facts may be obtained from the properties of intra-atomic particles useful to scientists and engineers working in the field of the peaceful use of atomic energy. Phenomena being studied at present in large particle accelerators may be investigated more directly with the aid of a satellite. Data can be obtained on the distribution in the cosmos of rare elements, such as lithium, beryllium, and boron.

The compression of the Earth at its poles creates a nonuniformity in the distribution of the Earth's gravitational field. In the direction of the poles, it is more intensive than in an equatorial direction. Owing to this trajectory of the sputnik, a declination from the trajectory will be had which it would not have in a uniform gravitational field of a sphere with a symmetrical distribution of the density of its mass. According to this not only the form of the Earth but also its density in various radial directions can be ascertained.

Satellites may be used even for aeronautical and sea navigation. A satellite, launched particularly along a certain meridian, for example the Greenwich meridian, may serve as an excellent radio beacon for orienting maritime and air ships.

Of great practical significance for the development of interplanetary flight will be the investigation of meteor bodies which will be realized with the aid of satellites. Meteor bodies consist basically of particles the mass of which is measured in parts of a milligram. The velocity of

motion of these particles achieves 60 Km/sec. A satellite can record encounters with such particles and, as a result, can clarify the distribution of meteor dust occurring in the upper layers of the atmosphere. At the same time, they can determine the distribution of meteor dust in the interplanetary space. Encounter of the satellite with larger meteor particles having a mass of 0.1 gram and greater (but that, however, is unlikely), can finish off the satellite by damaging it -- penetration of the shell, damage to the antenna, etc.

The use of artificial earth satellites as rebroadcasting points for radio and television transmission is completely practical. For this purpose, evidently, satellites moving comparatively slowly in relation to terrestrial points will be more suitable farther away from the Earth. Transcontinental radio television transmission may be organized with the aid of three satellites in one orbit. (Elektrichestvo, No 12, Dec 57, pp 1-2)

Meteor Studies at Stalinabad Astronomical Observatory

Investigation of the physical structure of the upper layers of the atmosphere was assigned to Stalinabad astronomers by the Interdepartmental IGY Committee of the Academy of Sciences USSR.

Two new meteor patrols, each equipped with seven highly sensitive cameras, were set up for these studies. One of these patrol stations is at Stalinabad and the second at a base point 1/4 kilometers distant from the first. Over 100 photographs of meteors have been obtained for the IGY under the direction of P. B. Babadzhanov, Candidate of Physicomathematical Sciences.

Simultaneously, several thousand radar echoes have been registered by two alternately operating radar stations. This radar method is particularly valuable in that it permits meteor observations around the clock regardless of weather.

Visual observations are also being conducted on drift of meteor trails for the determination of the speed and direction of stratospheric winds above Tadzhikistan.

The Stalinabad Astronomical Observatory has also received a number of reports from the Kulyabskiy, Kolkhozabadskiy, and Shakhrinauskiy rayons on observations of the rocket-carrier of the first satellite and also the second satellite.

A. Solov'yev, Candidate of Physicomathematical Sciences and director of the astronomical observatory of the Academy of Sciences Tadzhik SSR, points out that a basic portion of the workers for the IGY are Komsomol students of the Tadzhik State University imeni Lenin who are acquiring practical scientific experience necessary for entering "aspirantura" training.

Several scientific workers are preparing to defend their dissertations for the degree of Candidate of Physicomathematical Sciences. For example, for his dissertation the capable junior scientist Shavkat Isamutdinov is solving problems in the determination of the radiants of meteor streams by radar methods.

Urgent processing of an abundance of IGY material is being conducted by the astronomers along with their regular observations. It has now become necessary to overcome the difficulties caused by the shortage of calculating machines and experienced calculating personnel.

The Stalinabad Astronomical Observatory is preparing for participation in the 10th Congress of the International Union of Astronomers which is to be held this August in Moscow. According to A. Solov'yev, this congress will be a great political and scientific event which will contribute to even closer collaboration between scientists of the brother republics of the Soviet Union and other countries. (Stalinabad, Kommunist Tadzhikistana, 5 Feb 58)

Odessa Meteor Patrol Described

The Astronomical Observatory at Odessa State University is the chief institution in the USSR engaging in the study of meteors according to the IGY program. The work of the observatory and the operation of the meteor patrol is described in a news article by F. Kudryavtseva, a special correspondent for Izvestiya.

To better fulfill the tasks imposed upon them by the IGY, a group at the observatory created a new system of instruments for observing meteors--a meteor apparatus with an obturator of variable cross-section or "Kramer's obturator," as it is known after its inventor, Ye. N. Kramer, a senior scientific associate at the observatory who developed the apparatus together with N. I. Timchenko, a chief mechanic.

The central post of the meteor patrol is located on the outskirts of the village of Mayaki spread out on the right bank of the Dnestr River. Here, scientific associates Ol'ga Rudenko, Rina Teplitskaya, and students from Odessa University serve.

On a favorable night, five or six visible meteors appear in the field of vision of the aerial cameras' objectives. However, such favorable nights are few. Moonlight, fog, heavy snowfalls, and clouds very often disturb the meteor patrol.

When a meteor appears, its flash is recorded on a film. A chronograph times the flash with an accuracy to hundredths of a second. Instruments photograph the entire visible path of the meteor on the background of the sky.

Simultaneously with the central post, two auxiliary posts, one in Odessa and the other in the village of Kryzhanovka, conduct observations. Valuable scientific data can be obtained only in the case where the same meteor is timed by the central post and one of the auxiliary posts. Only then can the altitude of the flash and the extinction of the meteor be determined.

Shul'berg, deputy director for science at the observatory, says that the meteor patrol, equipped with a new system of instruments, obtains data with an accuracy to hundredths of a second. The observatory is equipped with other instruments which day and night, regardless of weather, records all meteors appearing within the operational radius. Recently, an apparatus for obtaining spectral photographs was set up.

Kudryavtseva concludes her news report with a discussion of the importance of meteor studies for providing information on the changes in the density and temperature of the atmosphere at an altitude of 70-130 kilometers, and their importance in future aviation in the stratosphere and outer space as well as the possibility of their providing a clue to the origin of the Earth and other planets. (Moscow, Izvestiya, 16 Feb 58)

Visual Aurora Witnessed in Khabarovsk in February

The residents of Khabarovsk observed in the north and northeastern part of the horizon a large display of northern lights on 11 February 1958. The glow appeared as huge light columns. (Moscow, Izvestiya, 13 Feb 58)

Two Solar Eclipses for 1958

Central-type solar eclipses will occur in 1958 on 19 April and 12 October. The first will form shortly after the Moon passes through its apogee. It will be annular so that the end of the lunar shadow will not reach the Earth. The second will form several hours after the Moon passes its perigee and will be a total eclipse. According to Tass, the 19 April eclipse will be visible in eastern Siberia and central Asian republics of the USSR. Its observation will also be possible in China and southern Asia. (Baku, Bakinskiy Rabochiy, 5 Feb 58)

Czechoslovak Solar Observations

Czechoslovakia is devoting special attention to meteorology during the IGY, and about 160 scientific and technical workers are participating in the meteorological program. The Hydrometeorological Institute (Hydrometerologicky ustav) performs most of the observation, but the meteorological observatory in Milesovka and the work center in Hradec Kralove also participate. All observations are made according to a plan. Operations carried out include: surface observations of weather, measuring of meteorological elements, measuring these phenomena at high altitudes by means of radio soundings, measuring various types of solar radiation and determining the amount of ozone in the air. Chemical analyses are made of rainfall caught at 22 stations located throughout the country. Reports on surface and altitude measurements of weather phenomena are ordinarily sent to the specialized center in Geneva and to the data center in Moscow.

Extensive research of the Sun is being carried out at eight astronomical observatories. The main center is the Institute of Astronomy of the Czechoslovak Academy of Sciences (Astronomicky ustav Ceskoslovenske akademie ved), where 11 scientific and 13 technical workers are specializing in this program. Visual and photographic observations of sun spots are being made at six places in the country. Besides this, solar eruptions are constantly followed. Daily reports are sent to the Eurasian and the West European centers and fortnightly reports are sent to centers working on daily maps of the Sun in the Soviet Union and in West Germany.

Pictures are taken daily of solar prominences and pictures have been taken showing the development of several series of explosive prominences. Solar radio emissions are picked up on the 56 centimeter wave length and results of measurements are published in monthly bulletins. Some 142 major radio emissions have been recorded. The results of observations at the Ondrejov observatory are highly valued in foreign countries. One of the best experts in the study of the solar chromosphere, Dr Ellison, called the work of astronomers in Ondrejov the best organized visual observation of eruptions in Europe. (Prague, Mlada Fronta, 19 Jan 58)

Hertz Institute Radiotelescope

A parabolic reflector (2), having a diameter of 36 meters, is being used for radioastronomical research and IGY observations in East Germany. The reflector is located in the northern part of East Germany and belongs to the Hertz Institute in Berlin. (Prague, Rude Pravo, 20 Jan 58)

(2) Photo available in source, p 3.

IV. OCEANOGRAPHY

Vityaz Returns to Vladivostok

The Vityaz, flagship of the Soviet Scientific Research Fleet, has returned to its home port Vladivostok, after almost 4 months of voyaging during which she covered over 17,000 miles. The leader of the Vityaz Expedition, Prof V. G. Bogorov, Doctor of Biological Sciences at Moscow University, in an interview with V. Sorokin, Pravda correspondent, gave some details of the Vityaz's second voyage under the IGY program.

The vessel traveled a course, south along the 174 meridian West longitude to New Zealand; thence, north along the 172 meridian East longitude. In this manner, the central and southern parts of the Pacific Ocean were traversed twice. As part of its work, the expedition obtained many deep-water specimens of fish, mollusks, etc. Photographs were made of the sea bottom at depths down to 9,000 meters. Deep-water trawling was a regular part of the expedition's duties.

A notable discovery was the finding of a hitherto unknown depression, lying north of the New Hebrides Islands. Depths of 6,200 meters were recorded here and the name of the ship, Vityaz, was proposed for this depression.

The Vityaz will depart on its third IGY voyage in a fortnight. (Moscow, Pravda, 28 Feb 58)

Scientific Research Ship Murmanets Explores Bering, Chukotsk, and East Siberian Seas

A letter to the editor of Smena from Aleksandr Fedorov, hydrologist with the Polar Scientific Research Expedition aboard the ship Murmanets, describes the life and routine of the men of the expedition. Fedorov explains that the Complex Polar Oceanographic Expedition of the Arctic Scientific Research Institute has been working in eastern Arctic seas since 1941, and has already made its 17th voyage in these waters. The majority of the members of the expedition are young specialists who have completed their schooling within the last several years.

The region being studied at present by the Murmanets embraces the Bering, the Chukotsk, and the East Siberian Seas. The expedition is equipped with instruments of the very latest design. Among them are those for registering water temperatures (surface, etc.), and for conducting observations on the direction and velocity of currents of water masses. One very interesting instrument automatically prints on a tape data on currents at great depths. Fedorov states that a considerable portion of this work was completed in the first week of the voyage. He ascribes this to the distinctive seaworthiness and speed of the ship and its ability to navigate in the ice-filled waters. The ship, at the time of writing, was in Bukhta (Bay) Provideniya.

Fedorov's letter is in answer to a letter from a Komsomol Brigade at Rostov-na-Donu. Members of the brigade had placed their letter in a crate of dried currants and it was found several months later when the case was opened while the ship was completing a voyage through the Chukotsk and Bering Seas.

Photographs published in the source include one of the Murmanets, one showing a sailor preparing to send down a recording instrument, and a picture of the rocky Chukotsk coast. (Smena, No 22, Nov 57)

V. GLACIOLOGY

Glacier Movement at Various Depths

An article by B. A. Borovinskiy, titled "An Experiment on the Determination of the Rate of Movement of Ice Deep Within a Glacier," describes attempts to determine the rate of movement of the ice deep within the Central Tayuk Su Glacier of the Zailiyskiy Ala-Tau Range during the summer of 1957.

Three methods were used: (1) tracing the equipotential lines, (2) measuring the potential, and (3) measuring the gradient of the potential.

In determining the rate of movement of the ice by the method of equipotential lines, a special electrode consisting of a metallic cylinder 50 millimeters in diameter and 60 millimeters long was lowered into a 25-meter hole in the neve basin of the glacier. A second power electrode was placed 350 meters from the points to be observed. The power was supplied by BAS-G-80-L-21 batteries. Measurements of the difference of potentials were made with the potentiometer EP-1 (sensitivity 0.05 mv/graduation).

The receiving electrode "N" was placed 10 meters from the mouth of the hole, and the point of equal potential was sought with the other receiving electrode "M." After this point was found and marked, the subsequent points were located until they formed the contour of the equipotential line. Then a tacheometric survey was made of the points of the equipotential line. The points were then plotted on millimeter paper according to the computed coordinates in the provisory system. Because of the difference of rates of movement of ice on the surface and deep within the surface, the electrode in the hole was displaced a certain distance. After 24 days of repeated determinations of the character of the equipotential lines and continuous treatment of the data, a 20-centimeter displacement of the equipotential line was discovered.

To determine the movement of ice deep within the glacier by the potential method, a receiving electrode "N" was placed one meter from the hole in the direction of the flow of ice. A second receiving electrode "M" was shifted in 15-centimeter steps in relation to electrode "N." After each shift of electrode "M" the difference of the potentials of the two electrodes was measured and recorded. A graph of the potential was compiled, and the projection of the electrode in the hole was determined in relation to the mouth of the hole.

During repeated measurements made during the 24-day period the perceptible shift of the maximum potential was established, and, subsequently, the shift of the electrode in the hole. The shift of the maximum of the potential in relation to the mouth of the hole during the first measurement was connected with the bend of the hole.

Finally, the measurements were checked by a plotting of the gradient of the potential. For this purpose the positions of the two electrodes were reversed, and the difference of the potentials was measured. During the passage of the receiving electrode over the electrode in the hole, a change in the sign of the gradient of the potential took place.

Thus, on the graph, the lines connecting the points of the passage of the gradient through zero represented a projection of the electrodes on the surface of the ice.

The results of the work indicated that, in the area of the neve basin of the Central Tayuk Su Glacier, the rate of movement of the ice at a depth of 25 meters is slower than that of the surface by 0.803 centimeter per 24-hour day. (Vestnik Akademii Nauk Kazakhskoy SSR, No 12, Dec 57, pp 56-60)

VI. SEISMOLOGY

Seismic Research in Kuriles and Sakhalin

A brief unsigned newspaper item, titled "Soviet Researchers in the Pacific Earthquake Center," reads as follows:

"An enormous fissure in the Earth's crust along the Kurile Island chain is the cause of the frequent earthquakes and seaquakes in this area, according to discoveries of Soviet researchers. The expeditionary group of the Academy of Sciences USSR active in the area has recorded up to 50 weak earthquakes with the aid of highly sensitive seismographic measuring instruments. These investigations are supposed to give an answer to several questions connected with the history of the geological development of the Far East. The work of these scientists is confined primarily to the Kuriles, the Island of Sakhalin, the deeps of the ocean floor, and the coasts of the Pacific Ocean.

"The group has at its disposal several research ships, which already have crossed the Sea of Okhotsk many times and have ventured 650 kilometers out into the Pacific. They are working in strict accordance with

(Halle, Freiheit, 16 Jan 58)

VII. ARCTIC AND ANTARCTIC

Soviet Antarctic Research Results

CPYRGHT

An unsigned General (East) German News Agency (ADN) report, titled "Animal Skeletons in the Antarctic," follows:

"Fossil remains of wood and impressions of plant leaves discovered by Soviet antarctic research scientists in the eastern part of Antarctica indicate that there must have been vegetation here about 200-250 million years ago. Petrified forms, presumably the skeletons of animals, estimated to be several hundred million years old, have also been found.

"These findings were made by Soviet scientists during a landing on Horn Bluff, at which time they also determined that the sandstone of this area contains up to 30 percent garnet and large amounts of cassiterite.

"The geographers of the expedition have, in the meantime, corrected the map of the South Pole area at several places. They found that the coast of Wilkes Land extends several dozen miles farther south than was formerly assumed.

"According to data of the Soviet glaciologist, Professor Shumskiy, who headed the investigations of the Antarctic ice cover in 1957, the average thickness of the South Pole ice cover is not, as formerly assumed, 1,500 meters, but 2,500 meters. Thus the total mass of the Antarctic ice has been estimated at about 30 million cubic kilometers.

"With their caterpillar tractors and sleighs, Soviet polar researchers are continuing successfully the still completely unexplored path to the so-called pole of relative inaccessibility of the Antarctic.

"Since departing from "Komsomolskaya" station, the crew had covered, by 5 February, almost 200 kilometers on an ice plateau 3,600 meters above sea level, where temperatures are around 45 degrees below zero. Several times, the eight caterpillar-track vehicles sank as much as 1 1/2 meters in the layer of powdery snow, which is several meters deep. Over the [redacted] the tractors left in the snow a trail about 70 centi-

[redacted] (Berlin, Vorwaerts, 10 Feb 58)

Soviets Find Antarctic Smaller Than Anticipated

According to source, members of a group of Soviet scientists recently published their findings on the Antarctic. Their report is said to have stated that the Antarctic is approximately one third as large as had been previously supposed. (Budapest, Technika, No 2, Feb 58, p 7)

Second Antarctic Continental Expedition Returns to USSR

The triumphant arrival in Odessa of the members of the Second Antarctic Continental Expedition of the Academy of Sciences USSR is reported in a news item.

Three ships were used to return these polar workers from Antarctica--the Kooperatsiya, from Mirnyy to the Island of Mauritius; the Angara, to Alexandria, Egypt; and the Pobeda, to Odessa.

V. D. Meshcherin, deputy chief of the expedition, as spokesman, expressed the company's appreciation for the warm and cordial welcome accorded them. Meshcherin also thanked the Communist Party and the Soviet government for the great care they showed for the welfare of the expedition participants. (Moscow, Izvestiya, 19 Feb 58)

Soviet Review of Results of 1956 Arctic and Antarctic Research

In the 1957 yearbook of the Bolshaya Sovetskaya Entsiklopediya (Great Soviet Encyclopedia) the Soviets cover their scientific research operations in the polar regions in a series of brief survey articles, of which a full translation follows. The maps referred to are not reproduced but are available in the original document.

1. "Results of Scientific Research Work in the Central Arctic," by V. Burkhanov

The 1956 operations were a continuation of a wide complex of scientific investigations that were conducted by the Soviet Union in recent years in the Central Arctic in the interests of developing the northern sea route and utilizing the Arctic regions of the USSR. In 1956 this complex was markedly expanded in connection with preparations for the IGY.

Investigations were made:

a. By mobile scientific groups of the high-latitude arctic air expedition, "Sever-8," which conducted complex investigations by means of polar aviation of more than 150 points of the western region of the Central Arctic which had remained up to that time the least studied (see Map of 1956 High Latitude Arctic Expedition).

b. By the scientific research drift stations "Severnyy Polyus-4" (North Pole-4), "Severnyy Polyus-5" (North Pole-5), and "Severnyy Polyus-6" (North Pole-6) (see Map of Routes of "Severnyy Polyus" Drift Stations). These scientific stations are actual drifting observatories with 20-30 members. During 1956 the stations covered a great deal of ground. (See aforementioned map.)

c. By the High-Latitude Arctic Sea Expedition on the diesel-electric ship Ob' (see Map of 1956 High Latitude Arctic Expedition). Along with Soviet scientists, three Scandinavian scientists took part in the expedition. The expedition made complex oceanographic investigations in the little-studied northern part of the Greenland Sea and made preparations for the IGY on Northeast Island of the Spitsbergen Archipeligo.

Work done in 1956 expanded knowledge of the Central Arctic. In particular, it permitted determination of the relief character of the bottom of the Central Polar Basin, a more accurate determination of the direction of ice drift and currents in the Arctic Ocean, and an explanation of the distribution characteristics of Atlantic and Pacific Ocean waters in it. The work contributed to the establishment of new ideas on the structure of the atmosphere, radiation balance, heat exchange between the hydrosphere and atmosphere, character of the ice cover, etc.

A bathymetric chart of the Polar Basin and magnetic maps required by seamen and aerial navigators were made more precise by investigations in 1956. A number of new mechanisms of the effect of magnetic storms on radio communications were revealed. Charts of predominating surface and deep currents in the Arctic Ocean, in connection with the northward flow of Atlantic and Pacific waters and the atmospheric circulation, and also the principal factors determining the rate of accretion and thawing of ice and change in its permanence were defined more accurately.

As a result of investigations conducted by the expedition of the diesel-electric ship Ob', material was collected on the water- and ice-exchange between the Atlantic and Arctic Ocean which has practical significance for solution of problems of glaciation of the polar basin and the course of the Northern Sea Route.

As a result of operations of the "Sever-8" expedition, a representation was obtained of the relief of the bottom of the little-studied western region of the Central Arctic and the character of the drift ice in this region. The direction of drift of the "Severnyy Polyus-6" station on the ice floe carried from the coast of Canada to the region of Wrangel Island was substantiated. Further improvement of aerial navigation procedures in the Arctic was obtained.

In 1956, automation of scientific investigation in the Arctic was significantly increased. For observations during drifting, expedition "Sever-8" equipped drifting ice with 16 automatic radio beacons and two automatic meteorological stations. In addition, 50 automatic current recorders, 20 automatic radio beacons, and 30 automatic meteorological stations were made ready for installation in the Central Arctic in 1957.

Operations were continued by the scientific drift stations in oceanology (measurement of speed and direction of currents, measurement of temperature and determination of the chemical composition of ocean water, hydrobiological samplings of plankton and benthos, measurements of depths, taking of test samples of the ocean bottom); in aerology (investigation of the composition of the atmosphere up to altitudes of 30-31 kilometers by means of regular releases of radiosondes, radar observations, and soundings of the lower atmospheric layers by helicopter); in glaciology (observations on the changes in the character of ice, regular measurement of the depth of ice and snow, study of their physical and mechanical properties, investigation of drift ice); in magnetology (magnetic declination at high latitudes); in actinometry (study of radiation of solar energy on the surface of the ice, snow, and water and the penetration, in depth, of this energy into these); in seismometry (investigation of micro-fluctuations in the body of an ice field); in medicine (study of the physiological changes in the human organism while drifting under polar night and day conditions, study of nutritional problems, etc.); and in ionosphere, cosmic rays, and other fields.

2. "Bacterial World of the Ocean in the Region of the North Pole," CRYRGHTKriss

In the years 1954-1956, the Division of Marine Microbiology, Institute of Microbiology, Academy of Sciences USSR, conducted work to ascertain the presence and distribution of microflora in the Central Arctic, in the depths of the Arctic Ocean, and under the perennial ice packs. Investigations covered the immediate circumpolar region and also the sectors between the North Pole and Severnaya Zemlya (1954-1955) and between the North Pole and the Canadian archipelago and Alaska (1956). Investigations were conducted from 42 stations; microbiological laboratories were organized on drift stations Severnyy Polyus-3, Severnyy Polyus-4, and Severnyy Polyus-5. Tests were made of layers of water at depths of 5, 10, 25, 50, 75, 100, 150, 200, 250, 300, 400, 500, 750, 1,000, 1,500, 2,000, 2,500 3,000, 3,500, 4,000, and 4,300 meters, and also from the bottom surface.

. Microbiological operations were conducted in the Central Arctic for the first time. Investigations showed that all the layers of water of the Artic Ocean and also the bottom surface layer is populated by various species of microorganisms. In the process of their activity microorganisms bring about distinct conversions of the dead organic substance and inorganic compounds making conditions possible for the existence of other forms of life--plants and animals. Thus, it became evident that in the Central Arctic, beyond the direct influence of continental and insular run-off and at very great distances from the sites of the world ocean, with a rich development of life, microorganisms living under the perennial ice packs provide a cycle of organic matter by influencing biological productivity of the polar basin at high latitudes.

The morphological composition of the microorganisms proved to be most diverse in the surface layers of the water. Here, both round and oval bacteria were found that were small and large disposed singly or in small clumps. Along with these, there were many bacilliform bacteria of various length: thin and thick, straight and curved. Besides these bacteria, there occurred filiform types and yeast cells often budding. The deeper we went the poorer the species composition; bacilliform bacteria were found principally at great depths. Yeasts occurred at all depths. Large vacuolized cells were noteworthy.

The general count of the microorganism population of the ocean surface in the North Pole region fluctuates between some thousands to some ten-thousands per milliliter of water. The quantity of bacteria decreases with depth; levels with a "special" hydrological character are the only exception. Thus, it was shown that at the upper and lower boundaries of the Atlantic Current penetrating to the North Pole region, the count of

the microorganism population increased several fold in comparison with the upper and lower levels, i.e., the bacteria were one of the indicators of the origin and dynamics of the water masses. A seasonal variability was demonstrated in the relationship of the composition of the microorganism population of the surface layers of the ocean near the North Pole. It is richer in July than in September.

 3. "Soviet Investigations in the Antarctic," by G. Avsyuk

Antarctica is the sixth continent of the earth discovered by Russian navigators at the time of the globe-circling voyage. 1819-1821, of the sloops Vostok and Mirnyy under command of F. F. Bellinsgauzen and M. P. Lazarev. It was studied very little; comparatively, only the coast was explored; the central parts of the area were "White Patches."

Antarctica exerts considerable influence on the climatic conditions and other natural processes, not only on the parts of the ocean adjacent to it but also on the entire world. Investigations of the Antarctic will occupy a central position during the IGY (1957-1958). To fully develop investigations from the start of the IGY, the USSR in 1956 began to conduct preliminary operations in eastern Antarctica in the sector between 80 degrees and 105 degrees East longitude. Three scientific stations were organized: one on the coast -- "Mirnyy"; and two in the central part of Antarctica -- "Vostok" in the region of the south magnetic pole and "Sovetskaya" in the region of the "pole of relative inaccessability." Later, the organization of three auxiliary stations was found to be necessary: "Pionerskaya" on the route to the "Vostok" station; "Komsomol'skaya" on the route to "Sovetskaya" station; and "Oazis" in Banger [i.e., Bunger Hills]. In addition, it was planned to conduct large expeditionary traverse investigations. The program of operations of the USSR in the Antarctic encompasses all aspects of geophysical investigations and is of great extent.

Investigations were conducted by the Complex Antarctic Expedition (KAE) of the Academy of Sciences USSR. On 5 January 1956, the first vessel of this expedition, the Ob', arrived in the Antarctic and the first Soviet citizens descended on the continent. On 13 February, the state flag of the USSR was raised at "Mirnyy." Here, there were equipped 20 basic buildings; special magnetic, seismic, and aerological pavilions; geophysical, geological, glaciological, aerological, gravimetric, aerophotogrammetric, and other laboratories; and a powerful radio station for direct communication with Moscow. Investigations on meteorology, geomagnetism, and earth currents, physics of the ionosphere, seismology, geology, glaciology, biology, gravimetry, and other branches of science are conducted in "Mirnyy." The Complex Antarctic Expedition is equipped with modern apparatus, mechanized land transport, and aviation. A reconnaissance flight of the coast in the area of its operation was made and showed important factual differences with the data of former maps

and expeditions. A general study of the section of the coastal belt was made. It was established that there were four types of icebergs developed in the section of operations of this expedition: slope-ice (ledyanyye skaty), broken-ice (ledolomy), jutting (vyvodnyye), and shelf ice (shel'fovyye ledniki).

A study of Drigalski Island situated in the Davis Sea not far from "Mirnyy" was made. This island is completely covered with ice lying on a foundation that is more than 100 meters below sea level. In January 1956, the largest "oasis" of Antarctica was explored, the "Oasis" of Bunger [Hills], discovered by Americans from the air in 1947. The "oasis" is composed of small hills with relative heights of up to 150 meters, free from ice, constructed chiefly of ancient crystallic rocks. About 200 fresh- and salt-water lakes of various sizes are found in it. The "oasis" possesses a unique microclimate warmer than the surrounding ice cover; even in winter, because of its special character, the winds of the oasis are free from snow. It was established that the "oasis" was formed as the result of a special combination of relief and microclimate conditions.

Geological investigations of areas free of ice showed almost complete absence, in this region, of sedimentary rocks, even in the make-up of the glacial moraines. This forms the basis of the assumption that the entire area of operations of the Complex Antarctic Expedition, from the coast to the interior of the continent, is part of an ancient crytallic shield of Antarctica. There are a number of indications that in Antarctica two phases of glaciation occurred, separated by a warmer period in which a considerable decrease in the ice cover of Antarctica resulted. Measurement of the ice thickness by seismic methods indicated that at 5 kilometers from the coast the ice thickness reached 600 meters; at 14 kilometers, 650 meters; at 23 kilometers, 800 meters; and at 27 and 50 kilometers, 1,000 meters. Comparison of these facts with the height of the ice surface showed that at a distance of 50 kilometers from the coast, basic rocks underlay the glacial cover at 300-500 meters below the ocean level. Thus, here, the glacial cover lay as if on the bottom of the sea. It was established also that in the interior of the continent at heights of about 1,000 meters above sea level (about 60-70 kilometers removed from the coast) the temperature never rises above zero and there is never thawing.

In fall 1956, an aerial survey was made of the coastal strip, covering an area of about 15,000 square kilometers. Reconnaissance flights were made over the interior of the continent in the area of the future "Vostok" and "Sovetskaya" stations. Here, the surface of Antarctica comprises an ice shelf with an altitude of about 3,500 meters near

the south geomagnetic pole, and of the order of 4,000 meters in the region of the pole of relative inaccessibility. According to certain data, it can be assumed that the mean temperature of the coldest months in this region drops to between minus 50 and minus 65 degrees.

In April, a tractor-sled train was dispatched to the interior of the continent (the first winter expedition to the interior of the continent in the history of antarctic study) to organize "Pionerskaya" station, which was built at a height of 2,700 meters, 400 kilometers from the coast. Even now, interesting data have been obtained at "Pionerskaya." In August, an absolute minimum of minus 66.8 degrees was recorded, the lowest recorded temperature in Antarctica. The mean temperature in August was minus 52 degrees; a temperature of minus 60 degrees persisted continuously for a week. The mean annual temperature in this region is close to minus 40 degrees. The wind here is weaker than at the coast.

Observations at "Mirnyy" make it possible even now to work out a number of new conclusions; for example, they established the presence of a previously unknown climatic central cyclone in Davis Sea and established more accurately the paths of cyclones along the shores of Antarctica. Their centers pass over, or lie stationary only over the sea. The troposphere in Antarctica both in summer and winter is colder than in the same latitudes in the north. In contrast to the Arctic, the stratosphere in Antarctica is higher in winter than in summer. The zone of greatest precipitation in Antarctica is in the coastal sector, a belt about 150 kilometers wide, the northern (outer) boundary of which lies 4-5 kilometers from the shore of the sea. Many clear days were observed in Antarctica. Therefore, the influx of solar heat is comparatively large, but, in addition, there is extremely great reflection of the solar rays from the ice surfaces (on the average, 75-80 percent), with the result that the general inflow of solar heat is one quarter to one fifth that of the same latitude of the northern hemisphere. For the region of "Mirnyy" particularly, there are the so-called runoff [Stochnyye] winds blowing from the south (from the continent). They are characterized by great force and recurrence. The speed of these winds rapidly decreases during upward ascent. The runoff winds are intensive at a distance of 350-400 kilometers from the coast; further in the interior of Antarctica they die out. Their distribution over the sea is confined to a distance of about 10 kilometers.

4. "Marine Biological Operations of the Complex Antarctic Expedition,"

The program of operations includes two basic parts:

a. Study of the raw materials base of the Antarctic whaling trade. Arrangement of investigations according to this project was dictated by the decrease in the supply of whales in the area where the Soviet whaling flotilla "Slava" now operates. Determination of the seasonal

distribution of plankton and deep-sea fish, serving as food for whales in the Pacific and Indian Ocean sectors of the Antarctic, is one problem of the investigations; another is also the qualitative and quantitative character of the distribution of the various species of whales and their feeding grounds in these regions.

b. Study of the zonal distribution of fauna in the world ocean. Abyssal fauna (of the great deeps of the world ocean) is one of the least investigated areas in the field of biogeography.

Hydrobiological investigations of meridian profiles along the Atlantic and Pacific Oceans are of special interest, particularly during the passage of the expeditionary ship from the north latitudes to the south and back. In the course of these operations, data will be accumulated on the zonal distribution of deep-water fauna of the world ocean by means of systematic catches of marine organism at various depths. Comparison of Arctic and Antarctic continental shelf fauna that have developed under ecological conditions which are similar but which have had a different historical past is of particular interest.

In 1956, biological work was done in all the principal profiles of the expedition. Observations were made on the distribution of whales (V. A. Arsen'yev). Material on phytoplankton and zooplankton was collected (K. A. Brodskiy and M. Ye. Vinogradov), on phytobenthos and zoobenthos (P. V. Ushakov and G. M. Belyayev), and on fish (A. P. Andriyashev and A. K. Tokarev).

a. "Phytoplankton and Zooplankton," by K. Brodskiy

In the region of drift ice of the coast of Antarctica (90-162E), there was discovered a large mass of microscopic algae (phytoplanktons) coloring the water a greenish brown. At Sabrina cost [120E], not only the water but the ice is likewise colored by the algae mass. By utilizing these algae as food, a large number of small crustoceans (copepodae and euphausiacea) developed at the ice boundaries; this agglomeration was discovered by the expedition, in particular, at 64 degrees South latitude. As is known, the euphausiacea serve as food for the whalebone whales [Mystacoceti]. Accumulations of the crustacea occur so densely that once the machinery of the expedition ship Ob' was stopped, in order to remove the mass of these crustacea from the filter pumps. In Antarctic waters, among the cold-water organism were found zooplankton that are widely distributed in the tropics (salpae and other crustacea), a phenomena analogous to that which is also observed among zoobenthos.

Meridian profiles conducted by the expedition from the Antarctic to Australia in the southern part of the Pacific Ocean and then through the Indian Ocean yielded a great deal of material on the latitudinal zonality of deep-sea fauna. In addition to an abrupt change in the composition of the fauna, there was a verified and marked impoverishment of plankton in the tropics, in comparison with Antarctic waters. Thus, at the shores of Antarctica the biomass was composed of approximately 3 grams per cubic meter and in the tropics about 0.05 gram per cubic meter, but a greater diversity of animal species was found in tropical plankton. As a result of the investigations, a boundary was found between the antarctic and subantarctic phyla at about 60 degrees South latitude along the profile of the Balleny Islands and New Zealand. Northward from this boundary, subantarctic plankton were encountered with a significant admixture of subtropical species. In contrast with that which was established in the northern hemisphere, in the southern part of the Pacific and Indian Oceans (in the areas of the investigations of the diesel electric ship Ob' in 1956) there were no specific fauna of the West Wind Drift that could be significantly distinguished from the subantarctic and subtropical plankton.

b. "Zoobenthos," by P. Ushakov

Collections of zoobenthos were made at 77 oceanographic stations (90 bottom-scooping tests and 23 trawlings).

The zoobenthos of the coast of Antarctica from 90 to 165 degrees East longitude is characterized by the abundance and tremendous variety of species of sponges, bryozoa, and echinoderms, the principal component of submarine landscapes in the boundaries of the continental slope. Antarctic fauna, to a high degree, are endemic. The numerous colonies of Cephalodiscus (of the pterobranchia group) are very specific for antarctic and subantarctic waters, and likewise the large flat isopods Serolidae. In regard to species, the fauna of the antarctic coast botton is significantly richer in its many groups than the arctic. In the composition of the coastal antarctic fauna, by virtue of the direct influence of the environmental oceans, there are a number of forms of clearly tropical appearance; these are solitary madrepore corals, numerous octocorallia corals, gorgonaceau, Echinoidea with large spines of the family Cidaridae, and certain others. There is almost a complete absence of crabs among antarctic fauna (they are only on subantarctic islands).

Although the Macquarie and Kerguelen Islands are greatly separated from each other and are divided by great depths, the shores of these islands have very similar fauna (at low tide, numerous polychaeta vermes, isopoda crayfish, amphipoda, and mollusks are exposed here); in

accordance with this, the indicated islands apparently must be attributed to one subantarctic phylum. According to the bionomic scene, these islands, in part, call to mind the Commander Islands [55N 166E]. For the first time, quantitative investigations of bottom fauna were made for the antarctic area. The population of the bottom of the antarctic shelf is characterized by a high index of biomass (for the 100-200-meter level, the mean biomass equals 1,347 grams per square meter, for 200-500 meters -- 239 grams per square meter). Nevertheless, these indexes are conditioned chiefly by the rich development of nonfood groups of benthos (sponges, bryozoa, and others). The total biomass decreases sharply with depth and at 1,000 to 3,000 meters it amounts to only 1.3 grams per square meter, about one tenth to one fifteenth of that at the same depth in the Bering Sea and the northwestern part of the Pacific Ocean (according to operations of the Vityaz').

A collection of tropical fauna was also made in the Indian Ocean on a meridian profile from Kerguelen Island to the Gulf of Aden.

c. "Ichthyofauna," by A. Andriyashev

Soviet ichthyologists, while conducting their first investigations, assembled collections of fish (more than 1,500 specimens) of marked scientific interest. At present, these are being processed in the Zoological Institute of the Academy of Sciences USSR and the Institute of Oceanology, Academy of Sciences USSR.

Unique living conditions over long isolation from other continents led to the formation of extremely specific and original antarctic ichthyofauna, three quarters of the species of which are endemic and belong to families distributed only in the antarctic area and adjacent waters (Nototheniidae and related families). There are no actual littoral ichthyofauna on the shores of Antarctica, but at moderate depths many species of trematomus, serving as food for seals and penguins, are common. At a depth of 300-1,600 meters, a trawl line yielded various species of the endemic-antarctic families Bathydragonidae and Harpagiferidae. Also taken at the shores of Antarctica were Licodini (Zoarcidae) and sea slugs (Liparidae), close relatives that are widely distributed in the seas of the northern hemisphere. Attentive study of these forms promotes further development of the theory of intermittent bipolar distribution of marine organisms. Of great interest are the operations at Kerguelen Island, where three species of white-blooded fish of the family Chaenichthyidae were successfully captured. Their blood is colorless, since in distinction from other vertebrates it is lacking in erythrocytes and hemoglobin. The white-bloodedness of two endemic kerguelen species, Chaenichthys rugusus and Ch. rhinoceratus, was established for the first time.

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