

# ON THE LIFE AND SCIENTIFIC ACTIVITY OF PROFESSOR A.Ya.ORLOV (125<sup>th</sup> anniversary of birthday)

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Figure 1: A.Ya.Orlov

Corresponding Fellow of the Academy of Sciences of the USSR (1927). Member of the Academy of Sciences of Ukraine (1939), Meritorious Science Worker of the Ukr.SSR (1951) Alexandr Yakovlevich Orlov (April 6, 1880 - January 28, 1954) was the most authoritative expert in the field of explore of fluctuations of latitude and movement of poles of the Earth, one of the founders of geodynamics science, which studies the Earth as a complex physical system subjected to the influence of the external forces. A.Ya.Orlov was also an outstanding gravimetrist who developed new methods of gravimetry and created gravimetric maps of Ukraine, European part of Russia, Siberia and Altai and bound them in a uniform network.

A.Ya.Orlov was born in Smolensk in the family of a clergyman. In 1894 he arrived in Voronezh and entered classical gymnasium, after graduation from it in 1898 he entered the faculty of Physics and Mathematics at the Petersburg University. There he studied astronomy under the guidance of the well-known scientists professors S.P.Glazenap, A.M.Zhdanov, private-associate professor A.A.Ivanov, astronomer N.A.Tachalov. In summer of 1901, being the student of the University, he worked in Pulkovo observatory. In 1902 upon graduation from the University with the first degree diploma he was retained at the University to prepare for a professorial rank and was sent for training abroad.

In 1903-1904 years he studied mathematics, mechan-

ics and astronomy in the Sorbonne University (France). First half of 1905 he spent in Germany, where he worked on geophysics, mostly, on seismology at Goettingen, and autumn of 1905 he trained in Sweden. On returning home at the end of 1905 he took the position of the assistant in the Astronomical observatory of the Yurjev University (nowadays, the Institute of Astrophysics and Physics of Atmosphere of Academy of Sciences of Estonia in Tartu, before Yurjev).

In 1907 he was appointed to the post of the calculator at the Pulkovo observatory, where he conducted observations of stars on a large zenith-telescope to study the fluctuations of a pole, and in 1908 was elected the astronomer-observer at the Astronomical observatory of the Yurjev University, where he engaged in researches of deformations of the globe under action of lunar attraction.

In 1910 A.Ya.Orlov has maintained the Master thesis in the Petersburg University and in the same year he was elected a member of the Permanent Seismic commission at the Russian Academy of Sciences. The commission sent A.Ya.Orlov on the International seismological congress that took place in 1911, in Manchester (England). Here A.Ya.Orlov was elected the member of the International Committee on study of deformations of the Earth and in the same year he visited the York observatory in the USA to study the photos of comets.

In 1912 A.Ya.Orlov participated in the expedition to Western Siberia on the rivers Irtysh, Obi and Biya from Tobolsk up to Bijsk, the purpose of expedition was measurement of gravity in the different points of Siberia. In the same 1912 on behalf of the International Seismic Bureau he organizes the construction of the Gravimetric Station in Tomsk, where the observations with horizontal pendulums above a lunar attraction had already begun in 1913.

A new stage came in the life of A.Ya.Orlov in 1912 - he was invited to take a post of the head of the Chair of Astronomy and the Director of the Astronomical observatory of the Imperial Novorossiysk (nowadays the Odessa National) University; and the following years of his life and activity were connected with Odessa.

There his talent of the scientist and organizer revealed itself completely. From that moment the basic activity of A.Ya.Orlov took place in Ukraine, where he was a director of six observatories, two of which (Poltava gravimetric and the Main Astronomical Academy of Sciences of Ukr.SSR) he founded.

In the Odessa period of his life lasting more than 20 years, from December 1912 till February 1934, A.Ya.Orlov left a deep trace both in the preparation of the astronomical staff, and in science, as the Director of the Observatory, which thanks to him became a powerful scientific establishment of not only All-Ukrainian, but it is possible to say, All-Union importance. It came as a result of his extremely labour – intensive and very important researches both in Ukraine, and in Russia – in Siberia.

A.Ya.Orlov had been working for 8 years, from 1912 to 1920, as the Head of the Chair of Astronomy of the University. In 1920 the Novorossiysk University was closed and divided on several institutes. However, A.Ya.Orlov during such a short period of his teaching in the University succeeded to prepare such famous scientists as Z.N.Aksentjeva, V.A.Albitsky, I.I.Witkovsky, V.S.Zhardetsky, D.V.Pyaskovsky, N.M.Stojko, and N.V.Zimmerman.

A.Ya.Orlov also made a wholesome influence and on the Petersburg students V.P.Tsesevich and V.V.Sharonov coming to Odessa for summer observations, which would later became outstanding scientists (V.P.Tsesevich in 1944-1983 years was the Head of the Chair of astronomy and Director of Astronomical observatory of the Odessa University). Then A.Ya.Orlov wrote and published the textbooks: "Lectures on Spherical astronomy" and "The Course of Theoretical Astronomy".

In 1913 A.Ya.Orlov carried out vast reorganization work in the Odessa Astronomical Observatory, showing qualities of a wise leader. The Odessa Observatory, created by heroic efforts of A.K.Kononovich with almost complete absence of resources, was at that time in a bad condition. A.K.Kononovich, who was very sick in the last years of his life, could not give so much attention to the Observatorys businesses, as earlier. The scientific interests A.K.Kononovich lay in the field of astrophysics, and the Observatorys activity developed in an astrophysical direction. After the death of A.K.Kononovich in 1910 the management of the Observatory was entrusted to the professor of physics M.P.Kasterin, who was loaded with work even without that and could not give due attention to the Observatory.

Understanding perspectives of the astrophysical researches, A.Ya.Orlov did not restrain former directions of works, however, being interested in the development of astrometric researches, he achieved an increase of staff, he invited the graduates of the Novorossiysk University, who would subsequently become the known sci-

entists – N.M.Lyapin, M.V.Vasnetsov, to work in the Observatory; he has left at the Chair of astronomy a university graduate N.V.Zimmerman, eventually, a well-known astrometrist ; then D.V.Pyaskovsky, subsequently a professor of the Kiev University.

A.Ya.Orlov founded a scientific library in the Odessa Astronomical Observatory and organized reduction of the large numbers of observations saved in the Observatory. In particular, an 18-year's series of observations of solar spots was reduced, and a special method of calculations was developed, giving reliable results. From these observations the elements of solar equator were determined and the movement of the spots on latitude was investigated. It is necessary to note, that A.Ya.Orlov was distinguished by the careful preparation of the organization of the observations and same careful and without delays processing of them.

A lot of attention A.Ya.Orlov paid to putting the tool park of the Observatory in order and especially to the restoration of the Repsold's meridian circle, that was made in 1862 (was received by the Observatory in 1871) and which was not used for more than 30 years. A talented university mechanic I.A.Timchenko was involved in the works of restoration of the circle, and executed them with greatest diligence and ingenuity. As a result, the meridian circle became one of the best telescopes of such type in the country, and it is still in the working order nowadays.

It was necessary for A.Ya.Orlov to put the building of the Observatory and the adjacent territory in order. For all this money was required. A.Ya.Orlov succeeded in persuading the officials of the Department of Science of the necessity of modernization of the Odessa Observatory, and some modest means were distributed and spent reasonably. The observatory building was reconstructed and received a completed architectural shape; an artful fencing was built around the observatory. The refractor of Cook, acquired in 1886, was sent for reconstruction to England.

The large employment as the Observatory Director and the Professor of the University did not prevent A.Ya.Orlov from continuing scientific researches. In 1915 he completed a capital work, and the doctor thesis, entitled: "Results of the observations above lunar-solar deformations of the Earth", was maintained at the Petrograd University. That work abounded in the original and valuable considerations about prospects and methods of research; a new method of the processing of observations by means of harmonic analysis, developed by A.Ya.Orlov, was given in it. The method he applied subsequently to researches of a number of variable stars. Continuing gravimetric research, A.Ya.Orlov made two expeditions on Altai in 1916 and 1917, where he determined value of the acceleration of gravity in 9 points.

In that period A.Ya.Orlov was the acknowledged leader of astronomical and geophysical researches in

Ukraine. It was no wonder, that at that time he was invited and taken as the Professor and the Director of the Astronomical observatory on the staff of the Kiev University (unfortunately, no detailed information was kept on his work at the Kiev University), and in 1920 A.Ya.Orlov was elected by the ordinary academician of the Ukrainian Academy of Sciences (UAS) created by V.I.Vernadsky.

A.Ya.Orlov was not "the room scientist", he took alive interest in the problems of the city, in which he lived and worked. Landslips were a great trouble for Odessa at that time; they brought the large harm to a coastal part of city. A.Ya.Orlov joined actively in the work of "Commission on struggle with landslips" and in March, 1913 he made the report in the Permanent Central seismic commission "About struggle with landslips in Odessa". Level measurements at the coast of Odessa were executed within the framework of that work under a management A.Ya.Orlov. And further A.Ya.Orlov accepted active participation in reaching the decision on essential practical tasks.

At the liquidation of the Novorossiysk University the Chair of astronomy was abolished as well, and the Astronomical Observatory was recognized by an independent establishment under the name of the Odessa State Astronomical Observatory of Peoples commissariat of the Education of Ukraine. It came as a result of the fact that the Observatory overgrew the frameworks of the University division and, especially, divisions of any of educational institutes, into which the Novorossiysk University was split. And the Observatory joined in the execution of the important state tasks at once.

For the restoration of the economy destroyed during World and Civil wars and intervention, in conditions of the international isolation the organization of the astronomical editions, realization of astronomic and geodetic works was required. A.Ya.Orlov organized for the Naval department restoration of a geodetic network from Dniester up to Dnieper, undertook the edition of "Astronomical calendar" (1919-1923), and then "Naval astronomical annual" (1921-1924), extremely necessary for the restored fleet by the Black sea. A.Ya.Orlov began to issue "Circular of the Odessa astronomical observatory" (1921-1927) as the continuation to the issued earlier "Transactions of the Astronomical observatory of the Novorossiysk University" (1914-1915). But, as any big scientist, A.Ya.Orlov was engaged by the global problems connected to the movement of poles and tide deformations of the Earth ever more, for which study the network of stations and observatories was necessary.

Understanding the necessity of the development of astronomical researches for Ukraine, the academician UAS A.Ya.Orlov undertook actions on association of researches and put forward an idea of creation the Central astronomical observatory in Kanev area in Ukraine and created an Astronomical Computing Bu-

reau at the Ukrainian Academy of Sciences. However soon, the Presidium UAS liquidated the bureau without A.Ya.Orlov knowledge, and A.Ya.Orlov announced (1921) leaving the UAS in a mark of the protest. After a years delays and trials his application on leaving the UAS was satisfied in 1922.

However A.Ya.Orlov did not leave the idea of the creation of the central observatory in Ukraine and in 1921 sent to the Peoples Commissariat of the Education of Ukraine a number of letters on the transformation of the Odessa astronomical observatory into the Main state astronomical observatory of Ukraine. He manages to receive the necessary decision, the form and seal and to begin work of the Main observatory, which, probably, was not long (in the Odessa regional state archive ORSA, Fund -1395, List 1, 97, 1921 – only a few documents signed by A.Ya.Orlov with impressions of this seal were kept).

A.Ya.Orlov tried not only to prepare the necessary scientific staff, but also to involve young scientists already presented themselves in a good light the work of the observatory. When he was the director of the observatory I.D.Androsov, a known geodesist, N.M.Mikhalsky, a celestial mechanic, B.V.Novopashenny, an eminent astrometrist were invited to work. During directorate by A.Ya.Orlov in Odessa there came many well-known astronomers and astronomers-amateurs, also many scientists, which graduated from the Novorossiysk University earlier, for example, N.N.Donich. Undoubtedly, thanks to the attentive attitude of A.Ya.Orlov to the amateurs of astronomy we are obliged by the appearance in the science one of the greatest physicist and astrophysicist of the century G.A.Gamov, working for him for some time by the calculator, and also V.P.Glushko, an Academician of the Academy of Sciences of the USSR, in those years an amateur in he astronomy visiting the Odessa astronomical observatory, and other scientists. Let's note that A.Ya.Orlov was the first chairman of council of the Odessa branch of an All-Union Astronomical-Geodetical Society.

In 1922 and 1924 A.Ya.Orlov carried out a trip in Tomsk and Irkutsk in extremely difficult conditions and brought from there the gravimetric equipment to Odessa. We remind you that the gravimetric station organized in Tomsk by A.Ya.Orlov in 1913 still worked. In Odessa he determined a gravimetric point, included in the international catalogues; a fundamental mark of a highest, "zero" class was established used till now by the expeditions of scientific ships.

In 1924, during his directorate of the Odessa astronomical observatory, A.Ya.Orlov was elected the Dean of the Geodetic faculty of the Military Engineering Academy and in the same 1924 the gravimetric study of the Moscow abnormal station area was organized by him, which was completed the following year with success under the direct guidance by A.Ya.Orlov. In 1924

the Seismic commission of the Academy of Sciences of the USSR entrusted A.Ya.Orlov again with a management of observations in the USSR on deformations of the Earth.

In 1922-1928 years A.Ya.Orlov carried out works on the study of tides in the Black Sea, on the study of influence of the Moon on speed and direction of the wind. The measurements were carried out in Odessa, Sevastopol, and Poti. The researches by A.Ya.Orlov discovered that even in that practically closed reservoir, that the Black Sea is, a tidal wave exists with amplitude of 33 mm with an error of 1 mm. The initial phase was determined with an error of only 3 degrees. Thus, the fluctuations of the sea level achieve 6 cm at the coast of Odessa. It convinced A.Ya.Orlov of the irrationality of the creation a continental earth-tidal gravimetric station in Odessa, for the pendulums would have been influenced by the real-life sea tide. In that connection he puts forward the offer on the creation of the Gravimetric observatory in Poltava in 1924 and realization of the gravimetric survey in Ukraine.

The Poltava gravimetric observatory was founded by A.Ya.Orlov in 1926 for all-round study of gravity and for observations of latitude on a zenith-telescope. It was equipped with the first-class devices and was supplied with the scientific staff. In the autumn of 1926 A.Ya.Orlov went to Nizhniy Novgorod on behalf of the Academy of Sciences of the USSR for a choice of a place for an academic gravimetric station. As the result of his scientific merits the Director of the Odessa astronomical and the Poltava gravimetric observatory A.Ya.Orlov was elected the Corresponding Fellow of the Academy of Sciences of the USSR in 1927. In 1928 he was elected the honourable member of the Society of the amateurs of natural sciences in Moscow. A.Ya.Orlov was the Director of the Poltava observatory in 1926-1934 and in 1938-1951 years with an interval, when he worked in Moscow.

That extremely fruitful Odessa period of A.Ya.Orlovs life and activity came to an end in 1934 with his departure to Moscow, where he began to work in the P.K.Sternberg State astronomical institute (GAISH) of the Moscow University. There he organized a gravimetric branch GAISH (in Kuchlno) and became its Head. In 1936 he was elected the member of the International Latitude Commission. In 1937 he was nominated the astronomer of the Moscow Geodetic Institute and in the same year was elected the member of the management of the Moscow branch of an All-Union Astronomical-Geodetical Society.

In October, 1938 A.Ya.Orlov returned to Ukraine and was appointed the Director of the Poltava Gravimetric Observatory. That year he addresses the Presidium of Academy of Sciences of Ukr.SSR with a letter about the necessity of the creation of an Academic Central Observatory near Kiev. The decision on the creation was accepted and A.Ya.Orlov was offered the



Figure 2: On the photo: the Director of the observatory A.Ya.Orlov with graduates from the Novorossiysk University (autumn 1916(?)). From the left to the right: V.A.Albitsky, A.M.Rybakov, D.V.Pyaskovsky, N.M.Lyapin, A.Ya.Orlov, I.I.Witkovsky, V.S.Zhardetsky, N.N.Donich, and N.M.Stojko-Radilenko.

development of the scientific program. As a result of those actions the Ukrainian astronomical committee was formed and the considerable means for purchase of instruments and scientific researches were allocated.

That activity resulted in the fact that 1939 A.Ya.Orlov was elected the Academician of the Academy of Sciences of Ukr.SSR (repeatedly) and it was also entrusted to him to head the Carpathian Observatory (1939-1941 years). Then A.Ya.Orlov (1941) carried out a trip to the Far East (Blagoveshchensk) for the organization of the Far East Latitude Station, the project he offered in 1932.

The construction of the academic observatory in Kiev was postponed because of the war, but in 1943, after the deliverance of Kiev, A.Ya.Orlov returned to the questions of the observatory construction and in 1944 he was nominated as the director of the Main Astronomical (Goloseev) Observatory of the Academy of Sciences of Ukr.SSR, which he headed till 1948, and then in 1950-1951 years.

The results of the latitude observations by A.Ya.Orlov are stated in the book "Service of latitude", issued in 1958, and three volumes "Elected works" by A.Ya.Orlov were published in 1961. In the cities, where A.Ya.Orlov worked, the scientific conferences - so-called "The Orlov memorial readings" are held regularly, every 6 years. The first readings were carried out on the centenary from A.Ya.Orlovs birthday, the third readings were held in Odessa in 1992. The Orlov readings took place in 1998 and in 2004.

Everything, that we know about Alexandr Yakovlevich Orlov, chief of the Odessa astronomy in 1912-

1934 years, years of realization of the huge and rather labour-capacious works not only at our university and observatory, but also in Russia, and in Ukraine, speaks about an extraordinary versatile, active, purposeful and efficient man, easy on the rise, an initiator of the new and perspective scientific directions. He was the Person, which was not afraid for the sake of the science

to offer both a post, and a rank of the academician of the UAS, and other advantages. The results of his works are significant, so our gratitude for it to him is infinite.

A.Ya.Orlov was married, had six children. There is information that he was related with well-known Vitte family.