

INTRODUCTION

The idea to organize a Symposium on 'The Motion, Evolution of Orbits, and Origin of Comets' dates back to the IAU thirteenth General Assembly, held in 1967 in Prague. Owing to the impossibility of completing during the General Assembly the discussion on the problem of orbital evolution of comets Professor G. A. Chebotarev, then the newly elected President of IAU Commission 20, initiated the organization of the international symposium in Leningrad where the full scope of cometary problems might be considered from the viewpoint of celestial mechanics. This idea was warmly welcomed by the participants of Commission 20. Since this was to be the first international symposium on this subject, it was decided that it should encompass the following objectives.

(1) It would be essential to specify those problems of cometary dynamics presenting the greatest difficulties and to acquaint ourselves with the methods for their solution employed by astronomers of various schools and working in many different countries.

First of all, there is the problem of constructing analytical and numerical theories of cometary motion. The main obstacles in numerical theories are connected with the differential correction of orbits, the accumulation of errors in numerical integration, consideration of nongravitational effects, and the need for improvement in the accuracy of observations and in the ephemeris service. For proper consideration of the nongravitational effects it is necessary to know the causes responsible for them. This renders it desirable to have, on the one hand, an intimate acquaintance with cometary observations, and on the other hand, knowledge of the physical structure of cometary nuclei, the phenomena that take place in cometary atmospheres, the laws governing the mass loss from comets, and so on.

(2) The second objective was to discuss matters that may be solved by the coordinated effort of astronomers of different specialities. Among such questions are the distribution of the work necessary for preparing a new catalogue of cometary orbits and a new cometography, the establishment of strong links between theoreticians and observers, and the exchange of all essential data on the subject, in order to ensure the active development both of the observation and ephemeris service and of theoretical studies on cometary motion.

(3) There are also numerous problems of cometary astronomy that interact with those of other minor bodies of the solar system. For this reason we wanted to discuss the achievements and difficulties in the adjacent fields of dynamics of asteroids and meteor streams. This could lead to a more profound clarification of the peculiarities of their motion and the role played by the major planets in the orbital evolution of all the minor bodies of the solar system on a time-scale of centuries, millennia, and even longer.

(4) Another objective was the detailed examination of controversial or little-investigated problems, such as the study of all the steps in the evolution of cometary

orbits, research on the relationship between the long-period and short-period comets, analysis of the capture and eruption theories, discussion of the diffusion theory of nearly parabolic and long-period comets, consideration of stellar perturbations on the orbits of comets belonging to the so-called Oort cloud, and the investigation of the stability, structure, dimensions, and origin of the cloud. And finally, we wished to discuss, from the viewpoint of both celestial mechanics and astrophysics, the origin of comets and other minor bodies of the solar system.

Consideration of all these problems would indisputably be of value in the solution of the main problem of the cosmogony of the solar system as a whole.

Accordingly, IAU Symposium No. 45 was held in Leningrad during 4–11 August, 1970.

We gratefully acknowledge the help received from Dr L. Perek, General Secretary, and Dr C. de Jager, Assistant General Secretary, concerning the approval of the Symposium by the IAU Executive Committee. We are also much obliged to Dr de Jager for providing and allocating travel grants for many scientists, thus enabling them to participate in the Symposium.

The Presidium of the Academy of Sciences of the U.S.S.R., and particularly E. R. Mustel, Chairman of the Astronomical Council, were also most helpful in organizing and financing the Symposium.

The international Organizing Committee was appointed at an early stage in the preparation of the Symposium. It consisted of G. A. Chebotarev, Chairman (U.S.S.R.), M. Bielicki (Poland), M. P. Candy (Australia), V. V. Fedynskij (U.S.S.R.), E. I. Kazimirchak-Polonskaya (U.S.S.R.), L. Kresák (Czechoslovakia), J. Kovalevsky (France), B. G. Marsden (U.S.A.), E. Roemer (U.S.A.), and F. L. Whipple (U.S.A.).

B. G. Marsden displayed exceptional activity in the organization of the Symposium and performed the most valuable work of finally editing the Proceedings of Symposium No. 45 for publication.

The local Organizing Committee was: G. A. Chebotarev (Chairman), V. K. Abalakin, N. A. Belyaev, N. A. Bokhan, O. V. Dobrovol'skij, G. N. Duboshin, V. V. Fedynskij, E. I. Kazimirchak-Polonskaya, V. N. Lebedinets, †S. G. Makover, K. A. Shtejns, and N. S. Yakhontova.

We also appreciate the generous assistance of the following personnel of the Institute for Theoretical Astronomy, Leningrad: Yu. V. Batrakov, V. A. Ivakin, Ts. G. Khajmovich, S. V. Men'shchikova, T. B. Sabanina, and I. Ts. Zvyagin.

The programme for the Symposium was extensive and many-sided. The Symposium was divided into 14 sessions, each of which was concerned with a particular set of problems, and the sequence ensured the logical development of the entire range of problems. The duties of chairmen during the sessions were performed by: V. K. Abalakin (U.S.S.R.), M. Bielicki (Poland), G. A. Chebotarev (U.S.S.R.), A. Z. Dolginov (U.S.S.R.), E. Everhart (U.S.A.), V. V. Fedynskij (U.S.S.R.), E. I. Kazimirchak-Polonskaya (U.S.S.R.), W. J. Klepczynski (U.S.A.), B. Yu. Levin (U.S.S.R.), B. G. Marsden (U.S.A.), E. Rabe (U.S.A.), K. A. Shtejns (U.S.S.R.), P. Stumpff (Germany), S. K. Vsekhsvyatskij (U.S.S.R.), and F. L. Whipple (U.S.A.).

A total of 162 scientists participated in the Symposium, representatives of Argentina (1), Belgium (1), Czechoslovakia (3), France (3), Germany (1), The Netherlands (1), Norway (1), Poland (5), Sweden (1), U.S.A. (10), and U.S.S.R. (135).

More than 80 papers and communications were presented. All those presented in English or French were followed by abstracts in Russian, and those presented in Russian were supplemented by similar abstracts in English. Discussion in both English and Russian followed each of the reports.

Most of the reports and discussions were interpreted by A. P. Kirillov and E. A. Voronov, who are specialists in translating scientific and technical literature; some of the interpreting was done by V. K. Abalakin. A. P. Kirillov also took part in organizing the Symposium.

A series of excursions, organized in association with INTOURIST, enabled participants to visit the Main Astronomical Observatory of the U.S.S.R. Academy of Sciences at Pulkovo, Leningrad and its suburbs, and the art treasures of the Hermitage and Russian Museum. At Pulkovo the participants attended the ceremonial unveiling of the memorial to M. F. Subbotin, former Director of the Institute for Theoretical Astronomy, an outstanding scientist and author of classical works on celestial mechanics. The participants also visited the tombs of the distinguished Leningrad astronomers G. N. Neujmin, a former Director of the Pulkovo Observatory, and S. G. Makover and D. K. Kulikov, of the Institute for Theoretical Astronomy.

The Symposium was marked by its exceptionally warm atmosphere; it strengthened the friendly relations between the participants and permitted us to define the paths for our mutual cooperation on cometary problems in the future.

Leningrad
October 1970

E. I. KAZIMIRCHAK-POLONSKAYA