PREFACE

Studies in adaptive optics have been already developed in the USSR for more than a decade. Practical needs and the very promising prospects of the application of adaptive techniques in the investigation of the atmosphere stimulate the use of adaptive optics in coherent optical systems. It is the very class of optical electronic systems in which the use of adaptive optics results in most spectacular advancement. This is so, because finally the efficiency of operation of such systems in the atmosphere is determined rather by the parameters of the atmosphere itself, than by the characteristics of these systems.

In the second half of the 1950's the appearance of the very first studies by V.P. Linnik (USSR) and H. Babcock (USA) was indeed revolutionary. These studies can be considered to be even premature. They were ahead of the possibilities to implement their ideas but not in the ideas themselves. The available in the optical range at that time technologies made it impossible to use such devices as phased antenna arrays in the radio and microwave ranges.

Even the very first studies, including, the first experimental attempts, demonstrated that the truly "active" optical parts for adaptive optical systems could only be produced with a high–level technology. Even now the situation in manufacturing the components for adaptive optics is not too encouraging. The up–to–date analysis of adaptive systems demonstrates that the components of the system, i.e., such as wavefront sensors, "active" mirrors, and computers, must be produced at the very top limit of the currently available technologies.

These circumstances, as well as many others make one to develop mainly theoretical investigations in the new branch of optics. As for the design of the technical means and components of this system, this was the problem attacked by researchers in experimental optics, i.e., by those people who were occupied with the use of adaptive optical systems (AOS's) intended to operate through the atmosphere.

Speaking about advances of these studies in the USA, it should be noted that by the end of the 1970's many rather interesting results were obtained. These in particular, made it possible to propose a number of projects of imaging and laser beam forming systems. In the scientific literature there appeared a thematic issue of the journal of the American Optical Society called Adaptive Optics (**67**, No. 3, 1977).

Undoubtedly this issue of the Journal and its translation into Russian (edited by Prof. E.A. Vitrichenko) stimulated such studies in the USSR. Several Institutes of the Academy of Sciences of the USSR and scientific journals were coordinators of the research in this field. Recall here the appearance of the first Soviet thematic issue of the journal Izv. Vyssh. Uchebn. Zaved., Fizika, No. 11, 1985, edited by Academician V.E. Zuev. Following this event, the first All–Union Conference on atmospheric instability and adaptive telescopes was held in Simferopol' (the Crimean Astronomical Observatory) in March, 1986. The Conference had definitely stimulated further progress of such studies. Next years practically every All–Union Conference on optics, laser sensing, and propagation of laser radiation through the atmosphere organized the sections on the applied AOS.

In 1990 Atmospheric Optics, one of the leading journals on optics published by the Institute of Atmospheric Optics, Siberian Branch of the Academy of Sciences of the USSR devoted to adaptive optics its twelth number edited by Academician V.E. Zuev and Prof. V.P. Lukin. The undisputable advantages of this journal are short publication time and practically synchronous issue of its English editions in the USA.

The present issue of Atmospheric Optics is thus the third Soviet thematic issue on the problems of the AOS. It incorporates the results of studies reported at the Eleventh All–Union Symposium on propagation of laser radiation through the atmosphere and through the liquid media held by the Institute of Atmospheric Optics, Siberian Branch of the Academy of Sciences of the USSR in Tomsk in June, 1991. That very year actually completed the first decade of development of these studies in the USSR. It should be also noted that 1991 is the year of the tenth anniversary of the Laboratory of Applied and Adaptive Optics of the Institute of Atmospheric Optics. The cooperative efforts of the staff of this Laboratory and of the editorial staff of the Journal made it possible to publish thematic issues.

Prof. V.P. Lukin, Editor.

0235-6880/92/01 855-01 $02.00