PREFACE

The fundamental problem of taking account of the effect of scattering media on the informational characteristics of optical signals is still remaining a topical problem of optics of dispersed media. The solution of this problem is of applied importance for practical implementation of ideas of remote optical sensing of physical properties of the medium itself as well as of the objects observed through it.

The problems concerning the transfer of two—dimensional signals (image transfer) through the scattering media are the subject of the vision theory, which has been intensively developed during the last decades in many research centers in our country and abroad. The efforts undertaken by national and international research groups resulted in significant progress in this theory.

In investigating the effect of the scattering media on the quality of images of the objects observed through them, several different approaches were developed according to which the researches of scientific centers in this country and abroad (including USA, France, and Israel) can be tentatively divided into groups. Thus, some authors establish the basic characteristics of the image transfer in the scattering media based on the analysis of the images of special extended test objects. Other groups of researchers determine and study the system characteristics of the image transfer process, which can be used for solving some particular problems. Among the latter approaches the method of spatial frequency characteristics (see papers by E.S. Kuznetsov, T.A. Germogenova, T.A. Sushkevich, S.A. Strelkov, and others), linear system approach (D.M. Bravo—Zhivotovskii, L.S. Dolin, I.M. Levin, A.G. Luchinin, E.P. Zege, I.L. Katsev, A.S. Drofa, V.V. Belov, V.I. Savenkov, and others), and the Green's function method (V.S. Vladimirov, V.G. Zolotukhin, B.A. Kargin, A.N. Valentyuk, and others) should be mentioned.

Various approximate and numerical methods are widely used for solving the radiative transfer equation, which provides a basis for the theory of vision. Simplest and most evident among them is the approximation of lowest—order scattering, in particular, the single—scattering approximation. Many problems can be effectively solved using the two—flow and diffuse approximations. For solving the problems on the optical radiation transfer, the small—angle approximation and its modifications are now most widely used. Among numerical methods the method based on iterations over the multiplicity of scattering with subsequent integration over the characteristics should be especially mentioned. One of the most efficient techniques is the asymptotically rigorous Monte Carlo method.

Laboratory and field experiments by A.P. Ivanov, P.Ya. Ganich, B.D. Borisov, E.V. Babak, L.P. Volnistova, and others not only confirm the well—known theoretical results but also provide for new results (for instance, the t—effect) that stimulate deeper insight into the theory and development of some special investigations.

At present various aspects of the problem on the effect of the scattering media on the image characteristics such as contrast, spatial resolution, color characteristics; the dependence of the image quality on the spatial structure of the object (half—planes, small objects and their groups, rings, etc.) and their reflection properties (e. g., non—Lambertian reflection); and the joint effect of the medium, structure of the objects, and characteristics of an optical system on the image attract the attention of researchers.

This issue of the journal *Atmospheric and Oceanic Optics* is entirely devoted to these and other problems of image transfer through the scattering media. It has been prepared using the results of investigations carried out in recent years in the research centers of St. Petersburg, Moscow, Minsk, Nizhni Novgorod, Tomsk, and some others. The papers published in this issue cover practically all approaches to the solution of vision problems. As a rule, the authors of the papers presented here discuss passive systems of observations. It has been found interesting and expedient to include in this issue the papers discussing the results of some investigations concerning the active observational systems.

The editorial board of the Journal intends to publish annual topical issues (including international issues) devoted to the problems of the theory of image transfer through the scattering media.

Dr. V. V. Belov, editor