

Derivative Spectrophotometry and PAM-Fluorescence in Comparative Biochemistry

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 Springer



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ISBN 978-3-319-11595-5

ISBN 978-3-319-11596-2 (eBook)

DOI 10.1007/978-3-319-11596-2

Library of Congress Control Number: 2015958360

Springer Cham Heidelberg New York Dordrecht London

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Printed on acid-free paper

Springer International Publishing AG Switzerland is part of Springer Science+Business Media
(www.springer.com)

Foreword

The active application of physical and chemical approaches in various areas of physiology and biochemistry is the remarkable phenomenon of the end of the twentieth and the beginning of the twenty-first centuries. From this position, this book brings to the reader's attention a sample of the uses of advanced fluorescence and spectroscopic analytical methods in combination with computer processing of data for the solution of ecological and biochemical problems.

A considerable part of the book describes and discusses results of research on the scientific theme 6.50.2 of the Russian Academy of Sciences: "The further development of energetic bases of resistance of animal and green cells of *Procaryota* and *Eucaryota* to extreme influences of environmental factors."

The book is written by biochemists and physiologists who are interested in modern methods of physics and physical chemistry and are actively applying them in physiological and biochemical experiments. The scientific value of the first book published by the authors' collective from two institutes, *Derivative Spectrophotometry and ESR Spectroscopy for Solution of Ecological and Biological Problems* (2010), was assessed by foreign colleagues and by the world-famous publishing house Springer Verlag (Wien, Heidelberg, New York, Dordrecht, London). As a consequence of the positive reaction from the publishing house, this book was released in English under the title *Derivative Spectrophotometry and Electron Spin Resonance (ESR) Spectroscopy for Ecological and Biological Questions* (2013). In this uneasy time for Russian science, such recognition is very valuable.

The amazing idea of the known English physicist Prof. E. Rutherford about registration of a derivative of the usual absorption spectrum conquered the analytical world. Leading world manufacturers of electrooptical equipment now produce commercial devices for which Russia pays in currency. However, representatives of our industry, by virtue of inertness, indifference, or lack of understanding of the importance of this question and despite available individual domestic engineering designs, have not considered it necessary to show an initiative in producing this equipment. This happened even though the range of method applications has

enabled the solution of analytical problems from nuclear physics to microbiology and even though this method can be applied to ecological monitoring of the oceans and the surface of the Earth.

The method of pulse-amplitude modulated fluorescence (PAMF method) appeared in the late 1980s and has quickly earned a world reputation in the international competition against other analytical fluorescence methods. Analytical devices of this scientific direction are made by Walz (Effeltrich, Germany) and have spread worldwide (<http://www.walz.com>). To our regret, our country does not produce such devices, and application of the method is limited to two or three laboratories in Moscow and St. Petersburg, despite its excellent references.

The original feature of this book is the consideration of combining the possibilities of PAMF as a tool for the *functional* estimation of the cellular state with the results obtained by the derivative spectroscopy method, which characterizes the *structural* reorganization of a cell under the influence of external factors. Similar methodological approaches are absent from publications in the scientific literature. Moreover, this is the first report in the world on the large range of PAMF applications.

In the book there are many original conclusions and sometimes disputable points of view; significant attention is given to the description of questions of evolutionary biochemistry and carotenoid metabolism. Quite difficult phenomena are described in an understandable fashion and are beautifully illustrated.

Consolidation of the authors' experience on expansion of the application range of analytical methods considered in the book has promoted a profound knowledge of the evolution of biochemical mechanisms and an understanding of the molecular and energetic basis of cellular stability under extreme influences.

An abundance of illustrative material is a doubtless advantage of this book. The book is written in a good scientific style and contains a large number of the major literature references from different areas of the science.

The material offered by the authors, and their interpretation, will be of interest to a wide audience of biologists, evolutionists, geneticists, physicians, biophysicists, biochemists, analytical and pharmaceutical chemists, and radiochemists. It will also be valuable to postdoctoral students and students of biological, physical, chemical, and medical profiles of research, and also for any inquisitive readers wishing to familiarize themselves with features of biological work in the physical and chemical field and to enlarge their understanding of this interesting area of knowledge.

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Acknowledgments

First, our authoring team expresses appreciation to Springer publishing house for its many years of efficient work on questions of scientific literature publishing.

Preliminary (previously for a number of months) Senior Editor Dr. Claudia Panuschka has co-operated and agreed with our treatment concerning this second project. Dr. Panuschka is an excellent and intelligent specialist, a beautiful woman able to figure out an escape from any situation to the benefit of the publishing house and authors of published books. Her lovely soul and physical beauty harmonize with her logical consideration and insistence on observing the rules of the publishing house. The splendid administrative skills of Dr. Panuschka have promoted the employment of a highly professional team. We are extra thankful to Editorial Assistant Tatiana Grabner for accurate, quick, and kind work. We are delighted by the professional approach and kind communication of all staff members of Springer publishing house Production dept. for attention to our book and separately the group of Mr. Paramasivam Nagarajan responsible for professional accomodation the illustrations in the book. Additionally, we express our appreciation to Dr. Paula Antony, the translator of the Springer publishing house for careful correction of the English translation of the book initially prepared by I.G. Danilova and acknowledge the collective efforts of the team of Springer Wien, New York.

When working with the authors of this book, all mentioned and unmentioned employees created a well-intentioned atmosphere of help and readiness to give advice on the better appearance of the monograph. It was the collaborative friendly job of representatives of various countries.

We are very thankful to the OriginLab Corporation and its Customer Care Manager Barbara Tobias for the kind permission to publish some images and descriptions illustrating the application of the *Origin* package in our analytical work.

We cannot leave unacknowledged our scientific colleagues of the older generation from Germany and Austria: Prof. Dr. Wolfgang Klose (Karlsruhe, Essen); Prof. Dr. Hartmut K. Lichtenthaler (Karlsruhe) for the permanent interest in our work and for the kind permission to use interesting pictures illustrating the new

pathway of carotenoid biosynthesis; Prof. Dr. Achim Hager (Tübingen); Prof. Dr. U. Heber (Würzburg); and Prof. Dr. Harald Bolhar-Nordenkamp (Wien) for help in the work and productive discussions encouraging the qualitative consideration of scientific material.

Our gratitude is extended to colleagues who retired from science because of age or other reasons but who worked together with us: Dr. E. Brecht (currently Bürgermeister der Stadt Quedlinburg/Harz) and Dr. Doz. Armin Meister (Gatersleben/Aschersleben).

Finally, we express deep appreciation to the academician V.L. Svidersky for attention to the manuscript during book writing and to the academician Yu.V. Natochin for critical and constructive recommendations on the monograph text. We also express gratitude to the academician N.P. Vesvolkin for the constant support and timely remarks and counsel.

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