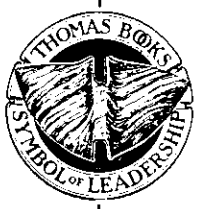
By

PROFESSOR GIORGIO PICCARDI

Director of the Institute of Physical Chemistry
University of Florence
Florence, Italy

The Chemical Basis of Medical Climatology

CHARLES C THOMAS • PUBLISHER
Springfield • Illinois • U.S.A.



Publication Number 459
AMERICAN LECTURE SERIES®

A Monograph in
The BANNERSTONE DIVISION *of*
AMERICAN LECTURES IN LIVING CHEMISTRY

Edited by
I. NEWTON KUGELMASS, M.D., Ph.D., Sc.D.
Consultant to the Departments of Health and Hospitals
New York City, New York

CHARLES C THOMAS • PUBLISHER
BANNERSTONE HOUSE
301-327 East Lawrence Avenue, Springfield, Illinois, U.S.A.

Library of Congress Catalog Card Number: 61-10380

With THOMAS BOOKS careful attention is given to all details of manufacturing and design. It is the Publisher's desire to present books that are satisfactory as to their physical qualities and artistic possibilities and appropriate for their particular use. THOMAS BOOKS will be true to those laws of quality that assure a good name and good will.

Printed in the United States of America

FOREWORD

Our Living Chemistry Series was conceived by Editor and Publisher to advance the newer knowledge of chemical medicine in the cause of clinical practice. The interdependence of chemistry and medicine is so great that physicians are turning to chemistry, and chemists to medicine in order to understand the underlying basis of life processes in health and disease. Once chemical truths, proofs and convictions become sound foundations for clinical phenomena, key hybrid investigators clarify the bewildering panorama of biochemical progress for application in everyday practice, stimulation of experimental research and extension of postgraduate instruction. Each of our monographs thus unravels the chemical mechanisms and clinical management of many diseases that have remained relatively static in the minds of medical men for three thousand years. Our new Series is charged with the *nisus élan* of chemical wisdom, supreme in choice of international authors, optimal in standards of chemical scholarship, provocative in imagination for experimental research, comprehensive in discussions of scientific medicine, and authoritative in chemical perceptives of human disorders.

Dr. Piccardi of Florence, Italy, presents the physiochemical equilibria involved in the incessant interactions between macrocosm and microcosm, outer world and inner nature, climate and life, environment and man in health and disease. We are nothing but what we derive from the air we breathe, the sun we absorb, the water we drink, the food we consume, the climate we inhabit, the weather we withstand, the existence we foster, the hygiene we practice, the life we lead. External spacial and solar phenomena influence all physical and chemical processes of life, particularly the inanimate colloidal substrata of living organisms ever attaining thermodynamic equilibria. The author brings to light the newer knowledge of meteorological influences shown by Hippocrates 2000 years ago. Climate means slope, reflecting the early

PREFACE

When Dr. Kugelmass proposed that I write a monograph on the chemical basis of medical climatology, I asked myself about my competence to handle such a topic. Climatology is usually held to be outside of the field of traditional physical chemistry. On the other hand, my chemical-physical studies regarding some common inorganic processes introduced me into a very new field which, even if it was not climatology itself, it still had some points of contact with that science: the field of relationships between spacial and chemical-physical phenomena in which I worked for twenty-one years, the last ten of which were fruitful. With my possession of the relationships between spacial and chemical-physical phenomena, I thought that it would not be unreasonable to attempt this enterprise inasmuch as I had never before treated traditional climatology with any depth.

The monograph which I present mirrors my own situation. Some arguments are treated diffusely, or very minutely; and others are recapitulated briefly; still others skirted or not touched upon at all. Therefore the treatment is in part exhaustive, in part schematic, and in part elusive. But from the chemical point of view it is complete enough *for what we know today*, arranged according to a criterion different from the traditional one and brought up to date by a literature selected upon the basis of the non-traditional criterion adopted and therefore limited. It was not possible for me to act differently if I wanted to remain within the limits of the length of the monograph and within the limits of the time allotted to me and at the same time demonstrate something new.

I have based the chemical basis of medical climatology upon the structure of water, solutions and colloids, that is upon modern structural chemistry and the physical chemistry of natural phenomena. It was exactly to demonstrate this structural aspect that I overcame the doubts I had regarding my competence in traditional climatology. Notwithstanding its defects, quite visible

Greek correlation of the earth's declivity with weather changes. Actually, climate connotes long-term means of conditions in outer space; and weather, short-cycle changes in the atmosphere, dominant in the dynamic status of human existence. It is not constancy but deviation in climatic cycles that contribute to organic evolution, for an absolutely steady sun and earthy-crust for the past 400 million years might have left us living as Silurian ooze-browsers deprived of climatic stimulation. Our energetic emergence on this Earth still leaves us with soft answers for hard questions on medical climatology, but the rapid pace of scientific progress will unravel the solutions. Each chapter in this monograph is solid, sometimes solemn, and at all times authoritative, for Dr. Piccardi heeded Francis Bacon's dictum: *Si quis hujusmodi rebus ut nimium exilibus et minutis vacare nolit, imperium in naturam nec obtinere nec regere poterit.*

I. Newton Kugelmass, M.D., Ph.D., Sc.D., *Editor*

and inevitable, I hope that this monograph can be of some use to its readers, for it reveals the experience of a chemist, away from his traditional field, who has wandered into the field of natural phenomena trying to bridge the gap between the physics of space and biology. A gap of this kind could not be spanned except by physical chemistry.

Since the facts upon which I base my exposition came in large part from my experimental research or that of my collaborators, I must recognize and thank all of those who worked towards the satisfactory completion of the research. In Florence, the principal center of the experiments, it was necessary for them to be conducted with absolute regularity every day, and on holidays too, and fixed hours for a unlimited period. My assistants, teachers, students and holders of CNR fellowships took this work upon themselves for ten consecutive years. A multitude of young people worked on the chemical tests with admirable devotion. It would be impossible for me to name them all or to thank them enough.

I must express my gratitude to all the foreign experimenters: Mrs. Capel Boute, chef des travaux at the Université libre of Brussels (Institute of Electrochemistry and Metallurgy, directed by Prof. Decroly), who for eight years has studied the chemical tests under great difficulty, and M. Gittens, the technician who aided her faithfully in her hard task; Engineer Doat, director of the Wiental-Wasserleitung who conducted, at the expense of his own agency, chemical test in their experimental centers in Untertullnerbach (Nieder Oesterreich) and his technician Mr. Wachter who conducted impeccably the experiments assigned him for five consecutive years; Dr. Miss Mayer of the Astronomical Institute of the University of Tuebingen (directed by Prof. Siedentopf); Mr. Berger of the Auroral Obervatory of Tromsoe (directed by Prof. Toensberg).

My thanks go to Prof. Bossolasco, director of the Geophysical Institute of the University of Genoa; Prof. Morelli, director of the Geophysical Observatory of Trieste, and his assistant Dr. Mosetti; Prof. Picotti, director of the Istituto Talassografico of Trieste. Particular appreciation is extended to all those who promoted or

organized studies on the chemical tests during the IGY and IGC in the southern hemisphere: M. Van de Elst, director of the Meteorological Service of the Congo and Ruanda Urundi; M. Viaut, chief of the WMO; M. Roulleau, chief of the l'Etablissement d'Etudes Météorogiques, Paris; M. Bost, chief of the Scientific Bureau of TAAF (Terres Australes et Antarctiques françaises), and the Belgian Committee of Antartic Research. A small part of this work was carried out with the contribution of the Consiglio Nazionale delle Ricerche Italiano.

I must also gratefully thank all the collaborators whom I have never known and who perhaps I shall never know personally. I allude to all those technicians and assistants who, during the IGY and IGC, carried out the research in Africa and in the Indian Ocean. How much we owe to these unknown workers! I remember them with gratitude.

Florence

G. P.

CONTENTS