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A. C. Candler

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ATOMIC SPECTRA

In two volumes

VOLUME I

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ATOMIC SPECTRA AND THE VECTOR MODEL

BY

A. C. CANDLER

*Sometime Scholar of Trinity College,
Cambridge*

‘There is one thing I would be glad to ask you. When a mathematician engaged in investigating physical actions and results has arrived at his own conclusions, may they not be expressed in common language as fully, clearly and definitely as in mathematical formulae? If so, would it not be a great boon to such as we to express them so—translating them out of their hieroglyphics that we also might work upon them by experiment.’

Letter from MICHAEL FARADAY to CLERK MAXWELL

VOLUME I
SERIES SPECTRA

CAMBRIDGE
AT THE UNIVERSITY PRESS

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CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org

Information on this title: www.cambridge.org/9781107505803

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First published 1937

First paperback edition 2015

A catalogue record for this publication is available from the British Library

ISBN 978-1-107-50580-3 Paperback

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P R E F A C E

The empirical laws on which modern spectroscopy is based were all worked out with a notation which seems to-day cumbrous and misleading; yet since 1929, when a large group of physicists adopted the modern simplifications as standard, no adequate review of the earlier work seems to have appeared in this country; the beginner must still refer to Fowler's *Report* and master a notation which he will soon wish to forget. To repair this omission is the chief aim of the first volume. In addition, an account is given of the splitting of spectral lines in a magnetic field, since this is essential to a full understanding of the series laws.

As Fowler's *Report* ordered series spectra, so Hund's *Linien-spektren* ordered the spectra of the elements and related them to the periodic system; if the evidence was impressive in 1927, it is now overwhelming; the theory is developed and the spectral types described in five chapters of the second volume.

Besides these two chief topics, there are others which are more or less closely related; some of these, notably hyperfine structure, are of very recent growth. The last chapters take up these topics one by one, and lead the reader to the boundaries on which research is now concentrated.

In the hope that the argument may remain within the easy comprehension of every working physicist, the vector model has been used throughout. Where the quantum mechanics has refined the predictions of the model, the results have been freely quoted and compared with experiment; but the rather heavy mathematics, which is the basis of even the simplest calculation, has been wholly excluded.

It is a pleasure here to record how much this book owes to the Cambridge Professor of Mathematical Physics, R. H. Fowler; without his encouragement it would never have been begun, or if begun, it would without his interest never have seen the light of day. To many others I am indebted for help in the later stages; J. E. Keyston was kind enough to write a draft

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Frontmatter

[More information](#)

vi

P R E F A C E

chapter on hyperfine structure; Dr R. W. B. Pearse has read chapters x, xvi and xxii, and advised me on them.

So many have helped me with the illustrations that I can here do little more than record their names and my gratitude. Professor H. Dingle has obtained me the loan of many photographs, which are the property some of Professor A. Fowler and some of the Imperial College; he has also advised me on many other points. Professor E. Back has sent me the photographs from which the plates in his book on the 'Zeeman-effekt' were made. I am indebted to Professor C. J. Bakker for some photometer curves of hyperfine structure, to Mrs K. Darwin for drawings of the Paschen-Back effect, to Dr R. G. J. Fraser for permission to copy deflection patterns from his book on Molecular Rays, to Professor J. B. Green for photographs of the incipient Paschen-Back effect and for blocks illustrating hyperfine structure, to Dr D. A. Jackson for photographs of hyperfine structure, to Professor W. F. Meggers for photographs of scandium multiplets, to Professor F. H. Spedding for absorption spectra of samarium and finally to Professor R. Tomaschek for the spectra of various phosphors.

The editors and publishers of many periodicals have kindly given me permission to copy from their works. Of these debts I hope the detailed references given beneath the figures are the best acknowledgment.

In a work in which so much detail appears, one cannot expect that errors have been entirely avoided; in the hope that these are not numerous, I shall be glad to know where they occur.

A. C. C.

LEIGHTON PARK
READING

CONTENTS

VOLUME I. SERIES SPECTRA

<i>Chap.</i> I. Introduction	<i>page</i> 1
II. Hydrogen atom	5
III. Alkali doublets	18
IV. Alkaline earths	46
V. Absorption spectra	68
VI. Zeeman effect	82
VII. Paschen-Back effect	105
VIII. Atomic magnetism	125
IX. Stark effect	144
X. The periodic system	161
XI. Doublet laws	203
<i>App.</i> I. Key to references	217
II. Physical constants	218
III. Rydberg term table	220
IV. Notation	222
Subject index	225
Author index	233

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[More information](#)

LIST OF PLATES

- | | |
|---|-----------------------|
| 1. Series in hydrogen, the alkalis and the
alkaline earths | <i>facing page 20</i> |
| 2. Multiplets from calcium, barium and
scandium | 46 |
| 3. Magnetic splitting patterns | 84 |
| 4. Magnetic deflection of atomic rays | 132 |