

**CHEMICAL AND PHYSICAL STUDIES IN
THE METAMORPHISM OF ROCKS: BASED
ON A THESIS
(WITH APPENDICES) WRITTEN FOR THE
DOCTORATE IN SCIENCE IN THE
UNIVERSITY OF LONDON**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649512973

Chemical and Physical Studies in the Metamorphism of Rocks: Based on a Thesis (with Appendices) Written for the Doctorate in Science in the University of London by A. Irving

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

www.triestepublishing.com

A. IRVING

**CHEMICAL AND PHYSICAL STUDIES IN
THE METAMORPHISM OF ROCKS: BASED
ON A THESIS
(WITH APPENDICES) WRITTEN FOR THE
DOCTORATE IN SCIENCE IN
THE UNIVERSITY OF LONDON**

METAMORPHISM OF ROCKS.

©

CHEMICAL AND PHYSICAL STUDIES

IN THE

METAMORPHISM OF ROCKS

BASED ON

A THESIS (WITH APPENDICES) WRITTEN FOR THE

DOCTORATE IN SCIENCE IN THE

UNIVERSITY OF LONDON.

BY

Alexander
A. IRVING, D.Sc., B.A., F.G.S.

LONDON

LONGMANS, GREEN, AND Co.

AND NEW YORK: 15 EAST 16th STREET

1889

TO THE

REV. T. G. BONNEY, D.Sc., LL.D., F.R.S.,

Past President of the Geological Society,

Professor of Geology in University College, London;

Fellow of St. John's College, Cambridge;

Honorary Canon of Manchester;

in admiration of his skill in microscopic petrology and as a field-geologist, and
of his extensive culture; this little work is dedicated by

THE AUTHOR.

1

2

3

4

5

6

7

8

9

10

PREFATORY NOTE.

The inception of this little work is due to the Presidential Address of Professor Bonney to the Geological Society in 1886. When that Address appeared it seemed to me that some of the leading ideas contained in it would admit of a fuller consideration from the chemical and physical side; and in this I was happy to find that the author of the Address concurred. My first attempt to deal with them was in a paper which I hastily put together for the Birmingham Meeting (1886) of the British Association. I found however that even in its incipient stage the subject was too vast to be dealt with satisfactorily in a paper, and I had to content myself with a brief statement of some of the leading points, which appeared in the Association's Report for that year.

In writing the Thesis on Rock-Metamorphism I was fully conscious of many imperfections in the treatment of some portions of the subject. It was especially so with parts of Sections ii and iii, which were written for the most part in 1886. As the other parts and the subsidiary matters contained in Appendix ii grew to considerable proportions, I found that with my daily work and the inroad which two other papers* made upon my time in 1887, I was not able to re-cast Sections ii and iii as I could have wished to do, without risking the delay of another whole year in sending in the Thesis, and this for obvious reasons it would have been unwise to do. These matters were worked out more fully in a supplement, copies of which have been privately distributed along with the Thesis. The Thesis has been submitted to some of the highest authorities in this country and on the Continent; and the friendly acknowledgements it has met with abroad have been to me encouraging in the highest degree. The matter contained in the Supplement is now published at the suggestion of the University Examiners incorporated with the original Thesis, which has undergone careful revision, the alterations being however to a great extent merely verbal. Some few further additions have been made both to the body of the work and to the original appendices; and these together with the matter contained in

* See Q.J.G.S. for May, 1888.

the Supplement have been printed in smaller type. A little delay in the publication has enabled me to draw attention here and there to valuable contributions to petrology made by foreign geologists of eminence in the 'Etudes sur les Schistes Crystallins' published by the International Geological Congress, which met in London, in September, 1888.

It would not be possible, were I to attempt it, to express my indebtedness to Professor Hermann Credner of Leipzig, whose masterly and philosophical work, 'Elemente der Geologie,' as it stands in the sixth edition, (1887), is still without a rival in our language, as a storehouse of geological facts and principles.* It is some gratification to me to find my own conclusions on some of the more important points in connexion with the genesis of the crystalline rocks so thoroughly in accord with those of Thomas Macfarlane, Esq., F.R.S.C., the result in his case of very extensive experience both as a metallurgist and as a field-geologist. It was with the greatest pleasure that I read his 'Origin of the Eruptive and Primary Rocks' (written in 1864) after the earlier sheets of this work were printed off, the author having kindly given me a copy of it at the International Congress in London.

The departure which our University has now made in recognising 'original work' and in doing its part in lifting the discussion of higher scientific questions out of the professional arena is of itself the best reply to the criticisms that have been passed in some quarters, and augurs well for the future of Science in this country. It may be questioned whether the outcry referred to is not to a great extent a reflex of a belief in that system of over-teaching which has done so much to check the growth of original scientific thought in this country, as compared with some of the leading nations of the civilized world, by giving too much advantage in the academical race to mere receptivity. It seems to be forgotten at times that the truest 'teaching' is that which stimulates the mind to active thought, not that which saves the student the trouble of thinking by loading the memory with second-hand knowledge. One necessary consequence of this is seen in the rareness of appeals in a great deal of the scientific literature of this country directly to nature, as compared with the quotation of names of authority as giving weight to certain 'views.' There are reasons for doubting whether, with the exception of the Royal Society (which represents

* Where not otherwise indicated the references to it in this work are to the 3rd Leipzig edition.

all the sciences) there is a single scientific society in London which is entirely free from the interested influence of a close profession. In so far as such an influence is allowed to exert itself there grows up a tendency to fetter the discussion of scientific questions by a spurious 'orthodoxy'; and just so far does such a society come short of the fulfilment of its highest function, which is the advancement of pure science, in the sense of an extension and correction of our knowledge of the material universe.

Truth is indeed 'a pearl of great price,' and not easy to find amid the heap of 'wood, hay, and stubble' of that department of literature which calls itself 'geological.' It is no difficult task for one possessed of a fair amount of training in the literary art to write on natural subjects so as to appear very profound to those who know a little less than he does. Those on the other hand to whom it has been given to experience the regenerating influence of Nature upon the human intellect, will acquit me of all suspicion of cant, when I say that above and beyond any honours or distinctions which it is in the power of any academical body to bestow, nay even beyond and above the appreciation of one's work by one's own contemporaries, research confers its own reward in the healthy habit of mind which it induces. It, and it alone, can teach us to appreciate the sublime beauty of that saying of Lessing's in his 'Streitschriften' with which the President of the British Association closed his Address at Manchester in 1887.

To get a glimpse of new fragments of truth before they have become the fashionable idol of the academic crowd, or the current coin of the examination-room, or the commonplace commodities of the publishing mart, is perhaps the purest pleasure of which on the intellectual side our present organization is capable.

A. I.

WELLINGTON COLLEGE,
BERKS.

1st June, 1889.