

# **CRYSTALLINE STRUCTURE AND CHEMICAL CONSTITUTION**

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Crystalline structure and chemical constitution by A. E. H. Tutton

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**A. E. H. TUTTON**

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AND CHEMICAL  
CONSTITUTION**



Macmillan's Science Monographs

CRYSTALLINE STRUCTURE AND  
CHEMICAL CONSTITUTION

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# CRYSTALLINE STRUCTURE AND CHEMICAL CONSTITUTION

BY

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## PREFACE

THIS memoir has been written in response to a request by the Editor of the series in which it appears for a short monograph, which, with a brief historical introduction, should present in a concise manner the author's original contributions to the subject of the relation between the form, structure, and physical properties of crystals on the one hand, and the chemical composition of the substances composing them on the other. The author has taken the opportunity of bringing together the results of investigations concerning this subject carried out by him during the last twenty years, and published in numerous memoirs in the *Philosophical Transactions* and the *Proceedings of the Royal Society*, the *Journal of the Chemical Society*, and the *Zeitschrift für Krystallographie*. It is hoped that this compilation of a connected story of these researches, and of a concise but comprehensive presentation of their main results, which is always a wise thing to make at that stage of a long series of investigations when definite general results have been arrived at, will be of use to fellow-workers. At the same time, an attempt has been made to present the story in a form which may not be without interest to a much larger circle of readers,

attracted to a subject ever so fascinating as that of crystals.

The original work to which the volume refers consists of three distinct parts, namely, the devising of new instruments of research, which was necessary in order to raise experimental work in this subject to a high level, the perfection of the means of preparing crystals for research, and the actual measurements of crystal angles and of numerous morphological, optical, and other physical constants. Considerable space has been devoted to the description of the first part, inasmuch as it has become increasingly evident that several of these instruments, notably the interferometer, have wider applications than those immediately connected with the object for which they were first constructed.

It has not been found possible to include within the scope of this book the full historical and contemporary references which the author would have wished to have made, but such omissions will be found remedied in his larger work on *Crystallography and Practical Crystal Measurement*, to be issued by the publishers of the present volume.

The author desires to record his thanks to the Councils of the Royal and Chemical Societies for their kindness in permitting the reproductions of several figures with which the original memoirs were illustrated.

A. E. H. TUTTON.



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# CRYSTALLINE STRUCTURE AND CHEMICAL CONSTITUTION

## CHAPTER I

### INTRODUCTION.

A GREAT scientific *renaissance*, even for times which will be for ever renowned for great advances in natural knowledge, has marked the close of the nineteenth century and the opening of the twentieth. It is generally associated in the popular mind with such remarkable achievements as the terrestrial discovery of the gaseous element helium, and of the other new inert elementary gases of the atmosphere—neon, argon, krypton and zenon ; with the experimental production of electromagnetic ethereal waves and their utilisation for wireless telegraphy ; with the discovery of corpuseles smaller than the chemical atoms, in the cathode rays of the Crookes high-vacuum tube, and of the surprising X-rays secondarily derived from them ; and with the still more wonderful discovery of the spontaneous evolution of both kinds of rays, and of helium atoms and those of another of the inert gases, from uranium and thorium, the two heaviest metals known to us, culminating with the finding of their yet more disintegratingly active relative radium ; together with all the immense consequences which the opening up of this new ultra-atomic world entails.