but in the region of the Rhine and in France. The sixteen beautiful pails from the cemetery of Hemmoor near Hanover are examples. One often finds Roman motives in use, but under forms scarcely recognizable. Among the most remarkable specimens of this kind belonging to the epoch of invasions must be classed the celebrated golden horns of Gallehus in Schleswig. To this period also belongs the Roman silver service found at Hildesheim.

Differences are pointed out between the recent Celtic civilization of Germany and that of Great Britain and Ireland. At the time the Romans gained a foothold in England local Celtic art had reached a high stage of originality and development. Celtic elements were even borrowed by the Romans, whose political domination over the land did not exercise any marked influence on the national art, which continued without interruption particularly in Scotland and Ireland, and which culminated in the heroic and legendary Celtic period of the first 500 years A.D.

The last two chapters are devoted to the closing epochs of prehistoric times in Scandinavia (500 to 1000 A.D.), and to Finland and the Slavic countries.

Müller, who is director of the National Museum of Danish Antiquities, has been known for years as a gifted writer on northern archeology. The present volume maintains the high standard the author set for himself in earlier works. Each chapter is accompanied by a selected list of references. One misses, however, an index which is all but indispensable in a work so important as this. The next general work on prehistoric Europe will in all probability devote more space to the contributions of such men as Rutot and Penck; those of the former on pre-Chellean industry and those of the latter on the antiquity of man from the standpoint of glacial geology.

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Grundriss der Kristallographie fur Studierende und zum Selbstunterricht. Von Dr. GOTTLOB LINCK. Zweite umgearbeitete Auflage. Pp. 254, 604 figures, 3 colored plates. Jena, G. Fischer. 1908.

Since the appearance of the first edition of this little text-book of crystallography twelve years ago it has remained the most satisfactory elementary treatise on the subject in any language. Unlike most text-books in the same field, it discusses crystallography in all its phases. Crystals are treated as bodies possessing certain well-defined properties in consequence of their structure, rather than merely as bodies characterized by distinct forms.

Starting with a brief statement of the difference between typical fluids and typical solids, the author develops the usual conception with reference to the growth of crystals, and follows this with descriptions of different kinds of crystal aggregates, a discussion of the symmetry of crystal planes, and statements of their simplest zone relations. The 32 classes of crystal forms are then treated in detail in 92 pages. In the first edition this discussion occupied 116 pages. The reduction is due to the omission from the new edition of some unnecessary explanations of figures, to the condensation of such explanations as are retained, and to a slight rearrangement in the order of treatment of some features of the subject. Everything essential to the understanding of the principles of geometrical crystallography remains, and in addition there has been introduced a most excellent series of photographs of crystal forms and combinations that will prove a welcome novelty to the student. On the whole, the first half of the revised edition does not differ materially from the corresponding portion of the earlier edition.

It is in the last half of the volume in which the greatest changes are observed. This now occupies 114 pages as against 93 pages in the first edition. The study of the physical properties of crystallized substances has advanced so rapidly in the past decade, and the results of these studies have become of such practical importance in physical and chemical investigations that they merit much more careful consideration than is usually given them in text-books published in the English language. Indeed, there is scant reference to

this phase of crystallography in English and American text-books, and in those in which the subjects are treated at all the discussion is so poorly developed as to be practically valueless for teaching purposes.

While the elements of physical crystallography are merely touched upon in the volume under review, the development of the discussion is logical and connected, and at every step the correlation between physical and geometrical symmetry is emphasized.

The most notable advance made in this new edition, however, is in the chapter dealing with the relations between the physical properties of crystals and their chemical composition. This portion of the book now occupies 26 pages, whereas in the earlier edition it occupied only 11 pages. Morphotropism, homomorphism, isomorphism, eutropism, polymorphism and isopolymorphism are illustrated by tables of substances exhibiting these properties, and the terms are explained in sufficient detail to serve the purpose of introducing the student into the fascinating field of chemical crystallography.

In all respects the volume will serve as an excellent text-book in elementary courses in crystallography. It is more comprehensive than the usual text-book pretending to deal with the subject, as it covers the field in all its aspects. The student is shown that crystals are not merely bodies possessing characteristic forms, but that they are bodies which also possess characteristic physical properties, and that such a close relationship exists between their geometrical, their physical and their chemical properties that these characters must be regarded as being connected genetically. That crystallography is a rational science and not merely a descriptive one is the impression left by the reading of the book. It is an impression to be greatly desired of American students, who are too apt to look upon crystals from the geometrical standpoint only.

The objectionable feature of the book is its lack of references. While this omission may be argued as possibly on the whole desirable in most elementary science text-books, in a text-book on general crystallography the omission is extremely unfortunate. The literature of physical crystallography is so widely scattered that a guide to the most important articles in this branch of the subject would certainly be convenient to the user of the volume. To advanced students—and that is the class to which Dr. Linck's book will most appeal, in America at least—a guide is absolutely necessary if the study is to be followed with any seriousness. It is to be hoped that in the next edition the author will insert at least a few references which will indicate where the most important discussions in physical and chemical crystallography may be found.

W. S. BAYLEY

The Cell as the Unit of Life. By the late ALLAN MACFADYEN, M.D., B.Sc. Edited by R. TANNER HEWLETT, M.D., etc. Pp. 381 and biographical notice. London, J. and A. Churchill; Philadelphia, P. Blakiston's Son & Co. 1908. $3.00 net.

The lectures brought together in this volume were delivered by the late Dr. Allan Macfadyen at the Royal Institution, London, during the years 1899–1902, and have been edited and published by Professor Hewlett as offering "some memento of a life full of promise and cut off all too soon." The difficult task, undertaken *con amore*, has been well performed by the editor, and a very readable and acceptable, although from its very nature somewhat out-of-date, "introduction to biology" lies before us.

The work is divided into sections, the first of which, under the caption The Cell as the Unit of Life, consists of five lectures on rather elementary biology in which a captious critic might find abundant material to feed his flame; if a morphologist he would take exception to such slips as that which speaks of the "Polar Body or Centrosome" (p. 57), or if a protozoologist to false impressions given by statements such as that on page 79 to the effect that always in feeding, "the *Amœba* seeks out and selects the alga cell." The second section, under the heading Cellular Physiology, is misleading in that little or nothing is said about physiology of the cell, the lec-