

adapt themselves to the reactions of the mineral, and feeling himself at last in touch with the affinities of the impenetrable atom. Let such consider and beware.

The description given of the contact-phenomena (p. 480) has at present an especial interest, and the author freely uses the term "schist" for the distinctly foliated rocks which are common along the flanks of the great chain, although such rocks are undoubtedly of Ordovician age. This is mere justice to the structures developed, and an encouragement to petrologists in the field, who are apt to resent a terminology based in any way upon geological age. While Prof. Sollas points out how the foliation in this case preceded the intrusion of the granite, we may take it that the same earth-movements produced both the one and the other at no long interval, the foliation being a prelude to the final yielding of the uptilted rocks.

The phenomena of foliation in the schists, and of flow-structure in the granite, may be studied by any visitor to Dublin upon the airy summits above Killiney Bay; but in some spots the granite itself has assumed a gneissic character through pressure subsequent to consolidation. On this point pp. 496-502 of the present memoir may be commended to workers in metamorphic areas; especially noteworthy is the insistence that the formation of cracks at right angles to the direction of flow, so often seen throughout the elongated constituents of a rock deformed by pressure, will serve under the microscope to distinguish cases of secondary from those of primary and igneous flow.

Among the interesting series of conclusions, we may remark how the soda-lime feldspars predominate over the potash varieties in the Leinster granite. This only confirms what microscopic examination has taught us of a host of "granites"; so that we may have to fall back upon the comfortable definition of the rock as consisting of "quartz, feldspar, and mica," unless we are willing to hand over many old acquaintances to the increasing group of the quartz-diorites.

Although the author states that we have no trace of volcanic ejectamenta emanating from the Leinster granite, we should be inclined to connect with it the great series of Ordovician "felsites," and associated tuffs stretching along its flanks from Wicklow southwards. Volcanoes characteristically break out upon the margins of an uplifted area, not upon its crest, where the eruptive energy may be presumed to become less and less; and highly silicated lavas, ancient obsidians and pumiceous tuffs, abound among the Ordovician rocks of Leinster, probably as the direct precursors of the granite.

Contributions such as these furnished by Prof. Sollas will be estimated at their full merit by those familiar with the long processes of isolation and analysis. The work of careful weeks may occasionally come before us in a page; and the results may appeal more immediately to the philosophic chemist and the crystallographer. But from such a memoir, as from that recently presented to the Geological Society by Messrs. Marr and Harker, we may learn what work lies before us even on familiar granite fells; and we may turn with renewed zest from the streets of Dublin to its highlands, to the moorland white with hoar-frost, and the broad glens reaching to the sea.

G. C.

THE FLORA OF WARWICKSHIRE.

The Flora of Warwickshire. "The Flowering Plants, Ferns, Mosses, and Lichens," by James E. Bagnall, Associate of the Linnean Society." "The Fungi," by W. B. Grove, M.A., and J. E. Bagnall. 518 + 34 pages, with a Map. (London: Gurney and Jackson. Birmingham: Cornish Brothers, 1890.)

THE interest to outsiders in the plants of Warwickshire lies in the fact that we have here a typical English Midland county, the botany of which is not in any way affected by proximity to the sea or high mountains. Although it is the central county of England, and forms the watershed of the Severn, Trent, and Thames, no portion of its surface rises above 855 feet. Its area is 885 square miles, or 566,458 acres, and it contains 4 hundreds, 2 cities, 1 county town, 10 market towns, and 209 parishes. In 1888 the crops of corn, beans, and peas occupied 106,000 acres; green crops, 38,602 acres; permanent pasture land, 312,000 acres; fallow, 8161 acres; and woodland, 16,650 acres. The soils are fertile, but varied, comprising nearly all kinds but those containing chalk and flints. All the southern and south-eastern part of the county is occupied by a strong clay resting on limestone. A soil of similar kind occupies the north-west. Over a large portion of the county, extending from Warwick to its western boundary, are strong clay loams resting on marl and limestone. Westward and south-westward of Warwick there is a strong clay over limestone. About Rugby and in the valleys of the Blythe and Tame are light sandy soils mixed with gravel. The remaining extensive portions of the county consist of a red sandy loam and a red clay loam, resting on freestone or limestone, and sometimes on gravel. The extent of unclosed land is very inconsiderable, the only extensive commons being those of Sutton Coldfield and Yaningale. The subjacent sedimentary rocks begin with the Cambrian and end with the Inferior Oolite, with a little volcanic tuff with intrusions of diabase and quartz porphyry in the north-east, near Atherstone.

The author of this book, Mr. James Bagnall, is one of the most meritorious and best-known of our working-men naturalists. He lives in Birmingham, and has devoted himself specially for the last twenty years to the study of the botany of his native county, and in the present work the result of his long and diligent labours is carefully summarized. He has taken rank as one of our best critical British botanists, and has been selected by the Linnean Society as one of its fifty Associates, and has been awarded the Darwin Medal given by the Midland Union of Natural History Societies for the encouragement of original research. His fellow-townsmen are justly proud of him, and when the present work was planned, a number of local gentlemen, with Mr. Joseph Chamberlain at their head, undertook to guarantee him against pecuniary loss. There was, however, no need to call upon them, as 430 out of the 500 copies printed were subscribed for before the book was issued.

The work consists of an introduction of thirty-one pages, which contains the needful explanations of the plan followed in the enumeration of plants and their distribution, together with a sketch of the physical geography, meteorology, and geology of the county, the latter

contributed by Mr. A. Bernard Badger. The great body of the work—328 pages—is taken up by the enumeration of the flowering plants and vascular Cryptogamia that grow in the county, and an account of their distribution and the special stations of the rarities. The county is divided into ten districts founded on the river drainage, and each of these has been worked separately. The last edition of the "London Catalogue" has been followed as a standard of nomenclature and species limitation. The county is specially rich in Rubi, and in studying them Mr. Bagnall had the advantage in starting of the oversight in the field of the Rev. A. Bloxam, who was one of the best practical authorities in this difficult genus that we have had in this country. The flowering plants of the county have been worked so thoroughly that it is not likely that any material additions will be made. Then follows the enumeration of the mosses, of which 236 species are known in the county. The Hepaticæ and lichens have not been worked so carefully, and in these orders there is ample scope for further research. The enumeration of the fungi is confined to the Hymenomyces and Gasteromyces. The enumeration of the lower Cryptogamia occupies 130 pages. Then follows a table showing the distribution of the plants through the ten drainage districts of the neighbouring counties of Leicester, Northampton, and Oxford. The book concludes with a sketch of the progress of botanical investigation in the county; the principal botanists who have worked within its limits being Withering, Stokes, Perry, Purton, Bree, and Bloxam.

The flowering plants and vascular Cryptogamia of the county summarize as follows:—Out of 532 plants generally diffused throughout Britain, Warwickshire has 501. Out of 409 species concentrated towards the south of Britain, Warwickshire has 285. Out of 127 plants concentrated in the eastern counties, Warwickshire has 31. Out of 70 plants concentrated in the western counties, Warwickshire has only 8. Out of 37 plants concentrated in the centre of Britain, Warwickshire gets 7. Out of 208 plants which represent the boreal element in the British flora, Warwickshire has only 19.

The book is not too large to be conveniently carried, which is a great advantage in a county flora. From every point of view it is thoroughly satisfactory, and will be a lasting memorial of the ability and diligence of its author.

J. G. BAKER.

OUR BOOK SHELF.

A Hand-book and Atlas of Astronomy. By W. Peck, F.R.S.E., F.R.A.S. (London and Edinburgh: Gall and Inglis, 1890.)

As Astronomer and Public Lecturer to the City of Edinburgh, the author of this work might reasonably be expected to be familiar with the requirements of a popular hand-book of astronomy. His aim, however, has not been to give a mere outline of the subject, but to give "complete and accurate" information in the principal departments of modern astronomy. In this endeavour he has compiled the volume before us, consisting of 170 pages, and embellished with 20 large plates and numerous smaller diagrams. For the ordinary reader who does not possess even a small telescope, the book has not much to recommend it. The descriptions are

often very meagre, and the spectroscopic work which is now engrossing the attention of so many astronomers is scarcely touched upon. The star maps and the tables which accompany them are excellent, but it is questionable whether they would not have been more convenient if issued separately, instead of forming part of a rather bulky volume. Yet, if these were taken away, there could be little excuse for the existence of the remainder. That is to say, there would be little left that is not already available in much cheaper forms. The author has fallen into the common error of attempting to combine a popular work, suited to the general reader, with one more especially adapted for those wishing to acquire a comprehensive knowledge of the subject. From either point of view, the deficiency of spectroscopic astronomy is very conspicuous.

Some of the large diagrams are really excellent, but others are very indifferent. Amongst the latter the most striking are Plate 9, illustrating solar phenomena, and Plate 19, depicting various spectra. In the latter the colours are unsatisfactory, and the spectrum of hydrogen is represented as consisting of two bright lines and numerous dark ones. It would have been a great improvement if, instead of the drawings of some of the brightest nebulae, photographs had been reproduced. The reproductions of photographs of the moon, taken by the author, are excellent.

Biographisch-litterarisches Handwörterbuch der wissenschaftlich bedeutenden Chemiker. By Carl Schaedler. (Berlin: R. Friedlaender und Sohn, 1891.)

BIOGRAPHICAL notes of some hundreds of chemists and physicists are here collected together, the names being arranged in alphabetical order. In the majority of cases there are given the date and place of birth, and; in cases where it has occurred, of death, besides the offices held, the most important of the work done, and the books, &c., written by the individual. The period covered extends from before the Christian era, and among the most recent names may be found those of Thomas Carnelley and Sydney Gilchrist Thomas. The collection cannot fail to be useful and interesting, but its value to historians would have been greatly enhanced if references had been given to the authorities from which the statements are derived. To do this would have probably added but little to the trouble of compilation, and would have made the volume a standard work of reference.

Round Games with Cards. By Baxter-Wray. (London: George Bell and Sons, 1891.)

In this little treatise, Mr. Baxter-Wray deals with all the most popular round games with cards. Among them may be mentioned nap, loo, poker, vingt-un, commerce, pope-joan, spin, together with eight others which are played at the present day. With regard to each game the reader receives sound advice as to the methods he should adopt, and those he should not. The variations of each game are well described, but mention might have been made—in the variation of nap called "misery, or misère"—of playing with all the hands on the table face upwards, which affords, when more than three are playing, an excellent game requiring much skill and tact.

Many suggestions and rules are given pertaining to the stakes, deals, &c.; and those who read the book will find in it all that will enable them to learn a new game.

Elementary Science Lessons: Standard II. By W. Hewitt. (London: Longmans, Green, and Co., 1891.)

THIS book is intended to be in the hands of teachers, who, by making a judicious use thereof, should be able to engraft much in the minds of young people in a sound and practical manner. The principle on which it is written is excellent. The work is drawn up on the same lines