LETTER TO THE EDITOR OF SCIENCE FROM THE PRINCIPAL SCIENTIFIC AUTHORITY OF THE FUNDAMENTALISTS

ON returning from Switzerland to my headquarters in England, I find your brief letter of January 6.

You say that you do not "have clearly in mind the circumstances" to which I have referred in my previous letter. I suppose that if you had thought the matter of sufficient importance you could have consulted your letter files of last year and the year before and those of some two years before that.

After the shameful way in which you have treated me, it is certainly very appropriate for you to say now that the "tone" of my letter "apparently makes inadvisable further consideration of the subject."

May I repeat that Professor Schuchert's letter is a clear libel, and that both he and you are due for some legal demands whenever I return to America from the rather extended trip around the world on which I have entered. An apology and retraction now would do no good; I am through with this sort of foolery. I will see what the law can do for me. Apparently there is only one kind of argument that such men as you and Schuchert can understand; and I intend that you shall have it.

GEORGE MCCREADY PRICE

SCIENTIFIC BOOKS

The Natural History of Crystals. By A. E. HUTTON. E. P. Dutton & Co., 1924. 274 pp.

The Structure of Crystals. By R. W. G. WYCKOFF. The Chemical Catalogue Co., 1924. 454 pp.

X-rays and Crystal Structure. By W. H. and W. L. BRAGG. Harcourt, Brace & Co., 1924. 4th edition, 313 pp.

THESE three books on crystal structure may well be used to illustrate the truism that no two writers can handle the same subject in the same way; each one sees the facts from his own viewpoint. A comparison of all three might also serve as a starting point for a sermon on the topic "not better, nor worse, but different."

Dr. Hutton became a crystallographer long before the days of X-ray crystal analysis. To him the exterior of a crystal is a wonderful example of the beauties of nature, and a constant stimulus to the crystallographer's curiosity, for from these external forms can be gained a whole theory of the inner architecture of crystals. To one of Dr. Hutton's early training, the results of X-ray crystal analysis are highly important because they offer clear evidence that the old ideas underlying the theory of space groups were sound. His chapter on "The Revelation of Crystal Structure by X-rays" is an excellent short résumé of the Laue, Bragg and Powder methods. Only in a few scattered instances has he placed a little too much faith in statements which he has found in the literature, so that he has at times unwittingly taken pure assumption for fact.

The whole book is written from the historical viewpoint and loses nothing in interest by being a little discursive—for instance, when the author ends a discussion of ice crystals by an account of his ascent on Mount Blanc in a snowstorm, or when he ends the chapter on "Experiments in Parallel Light" by a description of ancient and modern carvings in quartz. The book has twenty-one chapters, which cover the measurement of crystals by the goniometer and by X-rays, the types of crystal structure, isomorphism, polymorphism, morphotropy, optical properties, liquid crystals, etc. Appendices give an excellent glossary of technical terms, and a list of the thirty-two classes of crystals and their distribution among the seven systems of crystallization. The book contains many beautiful illustrations.

Dr. Wyckoff studied crystallography shortly after Professor Laue's discovery of the diffraction of X-rays by crystals. Like Dr. Hutton, he saw in the X-ray method a means of distinguishing, in some cases at least, between the various alternative structures which were compatible with the external symmetry of the crystal. The idea of crystal symmetry is so dominant in Dr. Wyckoff's mind that it was perhaps inevitable that his first chapter should be on "The Symmetry Characteristics of Crystals." It is characteristic of the author that his discussion of this topic is exact, and quite complete. The subject is difficult, but he has handled it well. From the standpoint of a salesman, "selling" his subject to the reader, it is unfortunate that this chapter comes first. The average reader will never finish it. If he substitutes pages 94–97 from Dr. Hutton's book, he can start in with Dr. Wyckoff's chapter two, and finish the rest of the book with pleasure and profit.

Contrary to the habit of some, Dr. Wyckoff takes quite literally the proverb, "If it's in the literature, it isn't so." For this reason, his discussion of the structures of the various crystals contains the cautious statements "seems to prove," "it is said," "is supposed," "it has been stated." The book has fifteen chapters. The first eight deal with crystal symmetry, X-rays, and the application of X-rays to crystal structure studies. The remaining seven deal with the structures of specific crystals. A bibliography, a group of tables for use with the gnomic projection, and a table giving sin θ in terms of tan θ are given in two appendices.

Sir W. H. Bragg had a world-wide reputation as

a physicist before he became actively engaged in X-ray crystal analysis. His son, Professor W. L. Bragg, also had a thorough training in physics. It is natural, therefore, that each of them should see the subject through the eyes of a physicist rather than of a crystallographer. To them it is of interest how a physical agent like X-rays can give us knowledge of the arrangement of atoms in crystals, and how the arrangement, so determined, is consistent with the external symmetry. This takes up, altogether, eleven chapters (diffraction, production and absorption of X-rays, the intensity of diffracted X-ray beams, X-ray spectra and the spectrometer, crystal structure, methods of crystal analysis and crystal symmetry). There is an excellent chapter on atomic forces as determined from crystal structure data, and another on the structure of organic compounds.

The whole book is written in the clear and delightful style which characterizes the lectures of the authors. This is not to be wondered at, for both the Braggs are excellent teachers as well as renowned physicists. The result is a book of fifteen chapters which should be read by every physicist, chemist and crystallographer. They will all find it "a faithful sketch of the subject as it stands to-day."

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SPECIAL ARTICLES

PLEISTOCENE FEATURES OF SOUTHERN NEW ENGLAND

AN article in this journal, of date October 2, by Robert W. Sayles, entitled, "Superficial Factors in Earthquakes," contains the following statement that invites correction and comment.

". . . in southern New England the ice pressure is supposed to have uplifted the land near the terminal moraine instead of depressing it, . . . Thus Long Island, Block Island and the Cape Cod region were higher than now at the close of the Glacial period. . . . Since the ice left New England, about 30,000 years ago, the more northern part has been uplifted and the southern part has been depressed. There has been a kind of tilt, the northern part going up and the southern part going down."

As to the coast and the belt of terminal moraine the statement is incorrect both in fact and philosophy. The coastal region participated in the Glacial depression and in the Postglacial elevation of all the glaciated territory. The evidence is very abundant and not inconspicuous.

Under the generally accepted theory of isostatic equilibrium in the earth's crust it is thought that the depression of the ice-weighted area should have been, at least partially, balanced or compensated by uplift of neighboring territory. While the location and character of a zone of uplift, or "peripheral bulge," is not determined, it yet appears quite certain that it would lie beyond the weighted territory, and in this case outside the New England coast. In so far as the downthrow of the glaciated area was due to elastic compression of the earth's crust it appears by mathematical analysis that the depression would extend far beyond the weighted area. Under the theory of isostasy, the subsidence beneath the glacier load was chiefly effected by plastic deformation, the forced migration or flow of deep-seated magma out from beneath the weighted area into the surrounding unweighted territory. The considerable depth at which pressure and heat would produce the required plasticity implies a thickness of the supercrust too great to permit of abrupt and sharp folding, or of a high and narrow bulge. At whatever radial distance any bulging occurred it must have been a wide zone of low elevation.

According to Mr. Sayles's conception the axis of oscillation, or hinge-line, was inland from the moraine and within the ice-weighted area. But it should be noted that the moraine belt was part of the loaded area, carrying beside the marginal ice the considerable load of drift deposit. Conceding that any hypothetic bulge would largely have sunk, in response to the Postglacial rise of the deglaciated area, the fact that no clear proof of such bulging has been found on our land territory argues for a wide uplift of small relief.

This complex and difficult subject in geophysics is discussed in an interesting article by Professor R. A. Daly in the October issue of the *American Journal of Science*. He there suggests that the downthrow of the glaciated area might, possibly, have been produced by a down-punching of the area, with surrounding faulting.

So much for the theoretic, and now for some facts. In southern New England we find many plains of sand and silt of wide extent and high above the sea, which are positive effects of standing water. Some of these water-laid deposits face the sea, and some occur in the terminal moraine. Some geologists formerly thought that these evidences of submergence belonged to an episode of glaciation antedating the latest, or Quebec glacier. Waiving the strong argument against multiple glaciation of New York and New England, the fact remains that these water-produced features are superficial, and the very latest geologic record of the region. They have not been