

PHYSICS.

(1) *A Student's Heat*. By I. B. Hart. Pp. vii+376. (London and Toronto: J. M. Dent and Sons, Ltd., 1916.) Price 4s. 6d.

(2) *Elementos de Física Descritiva para a 4ª e 5ª Classes dos Liceus*. Por Dr. F. J. Sousa Gomes e Alvaro R. Machado. 5ª edição, revista por Alvaro R. Machado. Pp. 528. (Braga: Livraria Escolar de Cruz y Ca., 1915.)

(1) MR. HART'S text-book of heat is intended for use in the higher forms of secondary schools, for advanced students in technical colleges, and for those taking a pass degree examination at the university. The author has included in his book descriptions of many modern methods of determining thermal constants and results of recent experimental investigations. Although the calculus is introduced in the section on thermodynamics, a knowledge of elementary algebra and geometry will suffice for the perusal of the greater part of the book. The text is furnished with a large number of clearly drawn diagrams, but the exposition in some parts is open to considerable criticism.

In the paragraphs dealing with electrical methods of measuring temperature the author assumes his reader to have no knowledge of electricity, and explains the chief points of the simple electric circuit with the aid of a diagram showing cell, ammeter, resistance, and voltmeter all connected in series. In connection with the platinum resistance thermometer, the compensating leads are not made of copper, nor is it usual to standardise the instrument in the way described by the author. The variation of resistance with temperature is represented by $R_t = R_0 (1 + \alpha t + \beta t^2)$. According to the author, β is neglected for approximate measurements, and $\alpha = 0.00366$; while for more accurate work the constants α and β are determined by measuring the resistance at 0°C. , 100°C. , and -273°C. At the last-mentioned temperature the resistance of a pure metal is known to be zero. Again, when describing the thermocouple method of measuring temperature, on p. 23, we have "the difference in temperature at the junctions induces an electromotive force, and the galvanometer registers a kick." The formula derived for the expansion of a liquid by the weight thermometer method, on p. 49, is wrong. On p. 86, dealing with molecular velocity and temperature of a perfect gas, it should be made clear that it is the square root of the mean square velocity of the molecules which is proportional to the absolute temperature and not their mean velocity. It is difficult to see how Charles's law for unsaturated vapours is verified by the experiment described on p. 131, since the vapour will be subjected to varying pressures. On p. 182 we have the statement that Newton's law of cooling is an approximation to Stefan's law. This is wholly erroneous, since the law of Stefan refers to loss of heat by radiation alone. Each chapter is furnished with a large number of questions selected from the papers of various examining bodies.

(2) As its title implies, this text-book is purely descriptive in character. The subjects dealt with are mechanics of solids and fluids, light, heat, sound, electricity and magnetism. The ground covered is only elementary, and upwards of 200 pages are devoted to introductory mechanics and properties of matter. No mathematical proofs of the formulæ employed are given, the idea being that the statements are to be regarded as laws to be verified experimentally. While there is nothing novel in the treatment of the subject, the text is accurate, concise, and amply illustrated.

BIRDS AND THE POET.

The Birds of Shakespeare. By Sir Archibald Geikie. Pp. x+121. (Glasgow: James Maclehose and Sons, 1916.) Price 3s. 6d. net.

THIS volume—one of the company of books which owe their existence to the tercentenary of Shakespeare—consists of an address delivered by the distinguished author to a country natural history society, and as such it must have served its purpose admirably. Beyond this it makes no pretensions, but it is all that it claims to be, and will fill a vacant place on the shelves of those who do not possess Mr. J. E. Harting's standard work.

In his opening pages the author lays stress on the development of man's feeling towards Nature from Chaucer to Shakespeare, from the simple, unreflective delight in the sights and sounds of the open air to the dawning of a sense of "the mystery of things" and its influence on the human mind; and again, at the close of the lecture, he passes to the further development of reflectivity manifest in the poems of Wordsworth, Keats, and Shelley, where the birds are not merely talked about, however poetically, but actually talked to, as being, like ourselves, "travellers between life and death." The main body of the volume is taken up with the passages in the plays and poems relating to the several birds, linked together by pertinent observations. Some half-dozen pages are deservedly devoted to that "pleasure for high-mounting spirits"—the sport of hawking, to which the birds of prey owed such consideration as they enjoyed; for, apart from this, Shakespeare shares the depreciatory attitude towards them current in his day and long after, including even the "mousing owl"; but then, as Waterton long ago remarked, from the time of Ovid downwards this useful bird has always been in ill odour with the poets. Passing on to the game birds, we get a too brief account of the various methods of taking them, and the sportsman to whom the "Diary of Master William Silence" is still an undiscovered treasure might have welcomed a footnote sending him to that invaluable work.

Here are one or two points which might receive attention when the book is reprinted. "The Passionate Pilgrim" and "The Phoenix and the Turtle" are drawn upon without any hint that these *réchauffés* are by no means wholly the work of Shakespeare. Loon, "a diver," and loon, "a