tures correct. I wish to make it clear that for the mislaying of the manuscript, and for the consequent delay in ultimately returning it, responsibility rests upon me. It suffices to indicate my responsibility for it, and to offer the apology hereby made for its happening.

W. J. CROZIER

In connection with the letter of Mrs. Brooks the following statement may be of interest.

The practice of printing the date of acceptance of manuscripts came about because in many cases papers had to be returned to the authors with the suggestion that certain alterations were desirable. It often happened that considerable time elapsed before they came back and were finally accepted. If in these cases the date were given when the paper was first received, it might appear that the delay in publication was entirely the fault of the *Journal* unless perhaps the true explanation were surmised in which case it is possible that it might be embarrassing to the author of the paper. The present practice avoids these difficulties and has elicited expressions of approval from many of our contributors: in fact the first criticism we have heard is contained in the letter of Mrs. Brooks. When MS has been accepted without revision, the aim has been to make the interval between the date of receipt and the date of acceptance as short as possible.

It may be added that the editors intend in all cases to acknowledge manuscripts promptly and to report as soon as possible upon their availability. It may happen that they need time to examine papers critically or it may be desirable to obtain the opinion of others. Delay is sometimes due to the absence of the editors and the necessity of forwarding MSS: this is especially the case during the summer. That delays of this sort are not serious is shown by the fact that during the last twelve months, for example, the average time elapsing between receiving a paper and sending it to press is about one month (it requires about two months to go through the press).

The editors desire to thank the contributors to the journal for their loyal cooperation in endeavoring to maintain a high standard. They will greatly appreciate suggestions by private correspondence with the object of increasing its usefulness.

THE EDITORS OF THE JOURNAL OF GENERAL PHYSIOLOGY

THE ELDEN PUEBLO

REFERRING to Professor Colton's note in SCIENCE of February 4, I regret exceedingly that, through inadvertence, I neglected to state in my paper before the National Academy that Professor Colton had already mentioned the existence of "Elden Pueblo" in a manuscript now awaiting publication by the Bureau of American Ethnology. I desire to give every credit to him for his reconnoissance of the region. In saying that the ruin was "practically unknown to any scientific man," I meant simply that no thorough excavation of the ruin had ever been attempted and naturally, therefore, its exact nature, dimensions and significance could not be known.

Regarding the use of the name "Elden Pueblo," inasmuch as this is the first ruin in the immediate neighborhood of Elden Mesa to be excavated and made available to tourists and students, and as that Mesa is a most conspicuous object in the surrounding landscape, I think that the appropriateness will not be questioned. As the other ruins which Professor Colton mentions are opened up and studied, equally appropriate names can surely be applied to them.

Although Professor Colton spoke to me of the site of Elden Pueblo in connection with numerous other sites in the Flagstaff region, I must say that it was due more to the efforts of Mr. J. C. Clarke, of Flagstaff that I undertook the excavation of this particular ruin. At no time in the course of the work was Professor Colton's measured plan used. Professor Colton aided my assistants to measure off the site of the ruin and a plan was made on which the walls were drawn in as excavated.

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SCIENTIFIC BOOKS

Astronomy. By JOHN CHARLES DUNCAN. xiii + 384 pp. 64 plates and numerous figures in the text. Harper & Brothers, N. Y., 1926. Price, $4.00.

SHORTLY after a copy of Duncan's "Astronomy" had been received from the publishers and while it was lying on my table awaiting examination, a student in the beginning course picked up the book and ran through the pages. His comments were, "Why don't we use this book in class? It actually seems to teach itself." A careful examination of the book has only served to convince the writer of the soundness of that student's judgment.

On the title page we find the simple statement, "A text-book"; and the book is all that and more. The liberal use of boldface type and excellent line drawings throughout the text certainly make it a manual of instruction. In addition to these features we find many splendidly executed reproductions of astronomical photographs which, together with much of the text written in a fascinating style, are sure to make the book one of interest and value to the general

reader. A certain amount of elementary mathematics is used in proving some of the statements, but in no sense can the book be called mathematical.

We find general introductions to all fields of astronomy and these are written in a fashion tending to spur the reader on to further investigation. This is admirably illustrated in the various sections dealing with controversial subjects. The author presents the factual material in an interesting style, gives the various theories equally fair treatment and then stops without thrusting his personal views to the foreground. The reader is stirred to seek further information; and it is a bit unfortunate that detailed references to the various sources are not given.

The method of treatment of the purely descriptive sections, such as those dealing with the planets, is admirable. The numerical data concerning the various objects are gathered together in tables, and these tables are placed in the body of the text and not banished to an appendix. With this material before the reader, the author is free to write his descriptions unhampered by a mass of numbers, and to point out clearly the significance of the tabular matter.

The history of astronomy has not been neglected in this text, for in nearly every chapter we find references to the pioneers in the particular field under consideration, and the dates of fundamental discoveries are indicated. The chapter dealing with the rise of the Keplerian Theory is worthy of particular mention in this respect.

The line drawings are very carefully made and chosen to explain the text in a most illuminating fashion. The star maps form a valuable feature, but it is unfortunate that, in the attempt to reduce some excellent charts to text-book dimensions, the lettering is reduced to illegibility. The photographic reproductions are splendidly done, and the subjects both new and valuable. It is very pleasing to find, in addition to the usual plate showing the circumpolar trails, plates showing the trails of equatorial stars when they are setting. Many of Professor Duncan's own plates, taken with the 100-inch, are reproduced; and the quality of these photographs is too well known to require further comment here.

It is unfortunate that such an excellently written book could not have received better treatment at the hands of those responsible for the format. The paper is much too heavy for the number of pages and style of binding, with the result that the book will not stand the treatment which it will receive in the hands of the average undergraduate. With these defects remedied, we shall have a book which will set a high standard, not only as a text for use in elementary classes in astronomy and for general reading, but also as a model for text-books in any subject.

WARREN K. GREEN

AMHERST COLLEGE OBSERVATORY

SPECIAL ARTICLES

ON THE ABSOLUTE ZERO OF THE CONTROLLABLE ENTROPY AND INTERNAL ENERGY OF A SUBSTANCE OR MIXTURE

THE writer read a paper on the above subject before the physics section of the meeting of the American Association for the Advancement of Science held in Philadelphia. Since the results are of a most far-reaching nature it was thought that an outline of the line of reasoning would be of interest to the readers of SCIENCE. From this outline the proof of the results could be constructed without difficulty.

The internal energy and entropy are each divided into two parts, one of which is externally controllable, and thus a function of the absolute temperature T and volume v, while the other is not. The least values these controllable quantities can have must correspond to zero values, for if they corresponded to finite quantities they would evidently not be externally controllable. If a surface is drawn corresponding to v, T, and the internal energy u as axis, using u in the general sense, the controllable internal energy is measured from the point where a plane parallel to the T and v axes touches the surface. Similarly the controllable entropy may be interpreted. The zeros of these quantities for all substances and mixtures can be shown to correspond to the condensed state at the absolute zero of temperature by means of the theorem (A) that the specific heat at constant volume is always positive, which may be said to follow from our motions of temperature and heat content, and the postulate (a) that the increase in pressure per unit increase of temperature at constant volume is not infinite, which will probably be readily admitted.

Consider first the controllable internal energy. Suppose that the substance or mixture in the condensed state at the volume v_0 and absolute zero of temperature has its volume isothermally *decreased* to v'. It can then be shown by means of the thermodynamical equation

$$\left(\frac{\partial u}{\partial v}\right)_T = T\left(\frac{\partial p}{\partial T}\right)_v - p$$

and postulate (a) that this corresponds to an increase in internal energy. U is the internal energy of the substance at the temperature T, volume v, and pressure p, and may be taken to refer to the controllable internal energy because the uncontrollable part would disappear through differentiation with respect to v. Raise the temperature to T, keeping the volume v' constant, which gives rise to an increase in the controllable internal energy according to Theorem (A), since the specific heat represents a change in the controllable energy.

Again begin with the substance at the volume v_0 and isothermal *increase* its volume to v''. No evap-