tact. One has a feeling that the group is a little firmer in the physical than in the biological sciences. In the latter the outlook is quite Batesonian. The historical perspective might well have included L. Agassiz, and more emphasis given to the work of Franklin and Willard Gibbs. One looks in vain for Kircher, the reputed discoverer of bacteria. But one volume can not be an encyclopedia.

This "History of Science" is in sharp contrast with the work of professional historians who weave their interpretations out of the impermanent threads of war, politics or economics. It is an intellectual challenge, though by no means written as such, to all other interpretations of the past, and a most convincing and stimulating revelation of the foundations of this age of material and intellectual achievement.

It should be read and reread by those responsible for the formulation and conduct of all forward-looking educational policies in our universities. It may be illuminating to those advocates of culture who have regarded science as mere technique, and to pietists who fear its materialistic devastations.

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Comets. By CHARLES P. OLIVIER. The Williams and Wilkins Company, Baltimore, 1930, pp. 246, illustrated. Price $3.50.

PROFESSOR OLIVIER wrote this book as a sequel to his "Meteors" with the purpose of supplying "a book of moderate size . . . useful to the astronomer who does not specialize in the subject, as well as to the average intelligent reader."

There is no doubt that the author succeeded in this. The book is well written and well printed. It fills a gap in modern astronomical literature, especially so as Chambers' "The Story of the Comets" is now somewhat obsolete.

The author selected several topics for his book. After chapters on the history of comets and general facts about comets follows a discussion of cometary groups, families, tails and spectra, chapters on several individual comets, connection of comets and meteors, collision of comets with the Earth and the origin of comets. In the last chapter the author gives his views on the origin of comets, and the appendix contains elementary notions from the theory of orbits.

The desire to avoid mathematics is probably responsible for the absence of a discussion of such important questions as the motion of matter in the heads and in the tails of comets, radiation pressure of the Sun and the luminosity of comets. However, no serious study of comets can avoid these topics, and the author frequently uses the terminology of the theory of comets without explaining it. The result is that in some few places the book will be hardly understandable even to an "intelligent reader." In the chapter on the "Spectra of Comets," for instance, such arbitrary notation as CNIV (cyanogen band λ3883), or the "third negative group of carbon" is mentioned without an explanation. Fluorescence and resonance phenomena are referred to, but the exact meaning of both is left for the reader to find out.

Some inaccuracies are unfortunately present in this book. On page 80 the wave-lengths of the Swan bands are given λλ5630, 5166, 4719 instead of the correct values λλ5635, 5165, 4737 for the brightest heads. The author does not explain that the angstrom is used here as the unit. On page 184 the wave-lengths of a band are given "from λ620 to λ700," again without mentioning that μμ is the unit. Indeed, no effort was apparently made to reduce all data to the same units. On many pages miles and kilometers are side by side. Some comets are denoted by Roman numerals according to the time of their perihelion passage; others by letters, according to the order of their discovery.

A misstatement occurs on page 184. The author says about Comet 1910a, "The several preliminary orbits published differed widely from one another. As an example the first three gave the inclination 62°, 85° and 57°, respectively. A correct orbit finally gave it as 139°, entirely reversing even the direction of motion! . . . No decided deviation from a parabola could be found." The reader might possibly infer that something went wrong with the computations, or that the comet was not observed accurately enough. However, this was the classical case of a triple solution, and the definitive orbit by Simas gave an indication of ellipticity.

On page 42, referring apparently to one of the famous "Schmidt's Clouds" in Comet 1882 II, the author says, "Its orbit proved to be quite similar to that of the main comet." On the contrary, Bredichin and others showed that the clouds moved under appreciable repulsive force of the Sun. The comet itself is denoted by the author as 1882 III, instead of 1882 II.

In the appendix the author gives *seven* elements for an ellipse, the semi-major axis and period are listed separately. The latter is denoted for no apparent reason as *Pe*.

From a statement on page 192 the author appears to be unaware that the question of the common origin of comets and asteroids was seriously discussed as early as 1851 by Stephen Alexander.

The typographic work is good, although a few misprints have been noticed. It is unfortunate that in references the volume is not indicated by the bold-face type as is customary.

The above-mentioned defects are not of a serious kind and can be corrected in the second edition. As it stands, the book will be very useful in awakening interest in comets among amateurs and as a reference book for professional astronomers.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

FIBER TAGS FOR WET SPECIMENS

TAGS bearing catalogue numbers or other entries for the identification of single specimens are an indispensable item in various museum and laboratory collections of objects preserved in fluid. It is obvious that such makeshifts as paper and tape labels are to be avoided, since the first requisite of a tag is permanence. The tag should be made of a durable material which withstands handling and resists disintegration in preserving fluids; the entry which it bears must be permanently clearly legible, and the attachment to the specimen must be secure.

A variety of permanent tags have been devised. Strips of sheet tin, stamped with number dies, may be seen in some zoological collections; these occasionally corrode in preserving fluids. Payne[1] seals a small paper label within a piece of glass tubing, bent into a loop at one end for insertion of the thread for tying. Robertson[2] and Pollock[3] present accounts of the employment of fiber tags in the storage of pathological specimens, at the University of Minnesota and the Mayo Clinic, respectively. Dr. Maude Abbott, in a personal communication, commends the fiber tags, stating that they have been used for some years in the Medical Museum at McGill University. Several years ago the writer, then unaware that the material had been so employed, chanced upon fiber composition for the manufacture of tags. Inquiries indicate that such tags are not generally known, and this note is presented with the aim to emphasize their desirable features. Fiber tags have been used in our laboratory over a period of several years for anatomical specimens preserved in formalin, alcohol, Kaiserling and Bouin's fluid.

Sheets of "vulcanized fiber composition" of different thicknesses and in three colors (red, black and white) are obtainable from dealers in electrical supplies. I have been using the 1/16 inch thickness (red), though a thinner stock may be as serviceable and is perhaps even more suited to tags of small size. The material is sold by weight. A sheet measuring 3 x 3 feet, 1/16 inch thick, retails for about $2.50. The sheet is cut readily with a paper cutter or heavy shears into tags of the desired dimensions (in this laboratory, about ½ x 1¾ inches). The tags are punched at one end for tying, and stamped with dies (in this laboratory, numbers ¼ inch high) to register the accession number of the specimen. Deep, clean-cut impressions are insured if the tag rests on a block of iron during stamping.

After some hours of immersion in fluid the tag undergoes a just appreciable swelling and becomes slightly limber. Excepting this initial change no alteration can be detected.

The features of the fiber tag may be summarized as follows: (1) permanence and practicability, evidenced by actual service in at least four institutions; (2) simplicity of manufacture; (3) low cost.

HAROLD CUMMINS

DEPARTMENT OF ANATOMY,
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1 J. F. Payne, "A Permanent Tag for Museum Speciments," Intern. Assoc. Med. Mus., *Bull.* 8, 1922.

2 H. E. Robertson, "Difficulties Encountered in the Condensation of Museum Material," *ibid.*

3 M. Pollock, "Methods for Concentration of Museum Specimens," *ibid.*, *Bull.* 10, 1924.

SPECIAL ARTICLES

WESTERN DUCK SICKNESS PRODUCED EXPERIMENTALLY

FOR the past two decades mortality among waterfowl in western states has attracted the serious attention of conservationists. During certain of these years losses among ducks and shore birds have been so great at some points as to make the annual toll taken by hunters appear insignificant. In 1910 untold thousands of waterfowl perished in the marshes about Great Salt Lake, Utah, and the years immediately following saw a recurrence of the sickness but, fortunately, in reduced severity. Yet even under these improved conditions it was necessary to bury the bodies of nearly 50,000 ducks at the mouth of Bear River, Utah, in the period from September 7 to 26, 1913.[1]

In 1914 the Bureau of Biological Survey undertook a study of the malady, assigning Dr. Alexander Wetmore to the task. The summer and fall seasons of 1914, 1915 and 1916 were devoted to the work and the results published in two papers, a preliminary report[2] in 1915 and a final bulletin in 1918[1] (refer-

1 Alexander Wetmore, "The Duck Sickness in Utah." U. S. Dept. Agri. Bul. 672, pp. 1–26, pls. 4, 1918.

2 Alexander Wetmore, "Mortality among Waterfowl around Great Salt Lake, Utah," U. S. Dept. Agri. Bul. 217, pp. 1–10, pls. 3, 1915.