precipitation was quantitatively inadequate to account for runoff largely was laid to rest.

Perrault's discourse includes also the first, or at any rate a very early, description of (i) sublimation of ice and snow, documented by loss of weight from a continuously frozen block of ice; (ii) interception of snow by trees and consequent loss of moisture to the forest floor; (iii) bank storage and alternate recharge to and discharge from aquifers in hydraulic continuity with rivers (of course he did not use the modern terms); (iv) fresh-water-salt-water relations, with some concept of the importance of the differing densities of the two fluids in explaining fresh-water wells near sea coasts; and (v) the role of slow drainout of saturated earth materials in maintaining the low flow of rivers. Oddly enough, Perrault persisted in believing that springs are fed by rivers and steadfastly refused to believe that precipitation could wet the soil and rock to depths sufficient to allow what we now would call recharge. From sources obscure, he also maintained the existence of a universal layer of clay at varying depths below land surface and attributed to the clay a major role in control of movement of water underground.

A discussion of that clay layer and a taste of the turgid style that permeates the book follows:

> The cause of these fluctuations is due to the arrangement of the continuous clay that is under the low plains and under the mountains, I mean that when the slope of this clay is not toward the current of the River, and that there is a cavity there in which much water remains which cannot flow into the River with the rest, or else that there is one or many of these basins we have mentioned, larger than in other places, the waters that remain in them can supply the continual evaporations, and the springs they produce flow with a continuous and almost even flow, because there is enough material to keep them in that state: but when this clay slopes toward the River, and there are only a few of these basins, or they are small, or there are none at all; and that by these means the water that is in the sands flows to the River, and these basins being small are soon emptied, the springs thereby suffer various decreases, and sometimes dry up entirely: so also on the contrary when the overflow water of Rivers has risen enough to enter these basins and on top of these beds of clay higher than the usual ones, which does not happen often; then since there is more material for evaporation, the springs become stronger and have more than usually copious and abundant flow.

The style, clearly, is Perrault's. The translator has leaned toward the literal rather than the interpretative translation in order, he says, to avoid reading into his statements more than Perrault knew or intended.

Soil scientists will be fascinated by a section (pp. 78–81 of the translation) that describes Perrault's expansion of Magnanus' studies in capillary rise, flow in unsaturated media, and demonstration that passage of salty water through soil does not—as many ancients maintained—remove the salt. The translator suggests that Perrault deserves a place as a precursor of soil scientists.

This is an important book in the history of earth sciences. Its appearance in English is a tribute to the diligence and scholarship of the translator—it is copiously and excellently footnoted—and to the zeal of George W. White, recently elected vice-president for North America of the International Commission for the History of Geological Sciences. White "practically commissioned" the work by presenting La-Rocque with a copy of Perrault's book on the condition that he translate it, as he also stimulated A. V. Carozzi to translate J. B. Lamarck's *Hydrogeology* (University of Illinois Press, 1964).

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Nuclear Structure

Unified Theory of Nuclear Models and Forces. G. E. BROWN. North-Holland, Amsterdam; Interscience (Wiley), New York, ed. 2, 1967. 271 pp., illus. $9.25.

The second edition of Brown's book calls for a second edition of this review [the first appeared in *Science* **148**, 622 (1965)]. The book has grown by simple accretion, by addition of chapters with no molding of the earlier chapters to the new need. The original title "Unified Theory of Nuclear Models" implies an explanation, from a common ground, of why the shell model, the optical model, and the collective model work; but there is very little of the fascinating applications to nuclei that give life to the models. The "and Forces" added to the title in the second edition is not descriptive of the added content, which is mainly a treatment of nuclear matter with its "effective forces" and alludes to the meson theory of nuclear forces only as it relates to these.

It is helpful to have impressive and difficult aspects of nuclear structure elegantly and concisely presented, but the book has too high a ratio of mechanics to philosophy, of superb mathematical tricks to needed transitional thought. It may help the very exceptional student soar, but in the hands of others it could contribute to the lamentable process of bringing up a generation of physicists adept in applying specialized tools but without a facility for approaching new problems.

The dubious pedagogy of compressing very involved nuclear-matter calculations into three additional chapters is illustrated by the question the reader encounters: What does it mean to create two holes in the single state m? One learns how to evaluate diagrams containing them, but not why. The answer would involve the additional bookkeeping of canceling disconnected diagrams, an operation which in a lecture might be called tedious but without which one wonders why one should be dazzled with the diagrams at all.

There is a lot of hard work being done and to be done to further our understanding of nuclei. The book is ambitious and perceptive in showing where hard work is being done and in doing some of it. Understanding could be improved if the link with first principles were firmer.

At one lighter point, with a lack of subtlety not typical of the serious parts, the author garbles de-Shalit's familiar introduction to a talk on finite nuclei: "Some of my best nuclei are finite."

Despite shortcomings, despite some disunity in the presentation of a "unified" theory, it must be said that nowhere else is to be found in so little space so much of the main thread of the far-flung and rapidly evolving modern theory of nuclear models.

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On Telling

Speaking and Writing in Medicine. The Art of Communication. CLIFFORD F. HAWKINS. Thomas, Springfield, Ill., 1967. 177 pp., illus. $8.50.

The broad appeal of this book is partly hidden by the "in medicine" of the title. Two chapters, which occupy only about one-sixth of the text, are in the particular province of the medical practitioner: "Listening to patients" and "Talking to patients." Their central focus can be described in a phrase: the doctor himself as a therapeutic

agent. Here the author gives deserved attention both to verbal communication with patients and to signals conveyed by the doctor's behavior, his manner of speech, and his "ahh" and "ohh." The remainder of the book, notwithstanding its medical slant, is devoted to matters important to all in the scientific professions who must speak or write for publication.

The helpful advice for public speakers concerns not only oral presentation but also the commonly used physical aids. Ten pages are devoted to slides alone—their makeup and showing. Anyone who has suffered from viewing slides overcrowded with data will appreciate the stress the author lays on this common fault, pointed up by an illustration of "an overcrowded slide resembling a page from a railway timetable" (actually a timetable showing 28 stations and their train times in 19 columns). The chapters on writing offer excellent discussions of "the pursuit of clear English," faults of writing and how to avoid them, and the mechanics of preparing a manuscript and illustrations. The author, an English physician, sustains the reputation of his countrymen for lucid writing, and gentle humor enlivens the pages. In a section on multiple authorship, he suggests to department heads who insist on routine inclusion of their names in by-lines that "this way of achieving reputation should disappear."

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Chemical Reactions

Reagents for Organic Synthesis. LOUIS F. FIESER and MARY FIESER. Wiley, New York, 1967. 1469 pp., illus. $27.50.

Reagents for Organic Synthesis is well on the way to becoming the reference book of choice for everyone concerned with techniques of synthesis in organic chemistry. The reasons for this are easy to identify. First of all, there is a great need for additional guidance to the vast literature of organic synthesis. In spite of the availability of extensive abstracting and title-listing publications, the task of locating a suitable method for carrying out some particular transformation can be exceedingly difficult. This is especially true with substrates that possess some complicating characteristic, such as a high degree of steric hindrance, an especially sensitive functional group, or even some unusual solubility properties. In these circumstances, if one can recall an analogous problem that has already been solved the task is made very much easier. Of course, the lack of emphasis on synthesis in much contemporary teaching of both undergraduate and graduate courses in organic chemistry contributes to the difficulties. This lack is particularly regrettable, since a strong synthetic background would enrich the currently favored areas of molecular spectroscopy, structural theory, and reaction mechanisms. In the meantime, the number of chemists with a large and critical knowledge of useful reactions is both small and decreasing. The present volume provides a most convenient way in which to ease the search for half-remembered techniques or to uncover methods previously unknown to the reader.

Of course, an equally important reason for the success of this undertaking is the well-known talent of the authors for writing and compiling. The Fiesers have devoted a significant portion of their lives to the study of organic chemistry and its literature and have been in close contact with many of the most active organic chemists all over the world. There are very few chemists with a comparable background, and fewer still who have had the energy and devotion to transmit their knowledge in book form. This breadth of experience has resulted in the production of a book which is at once personal in flavor and catholic in scope.

The book presents an alphabetical list of "reagents," along with much valuable information on their commercial sources, physical properties, preparation, and uses. Small comments of practical significance abound. The documentation is impressive. Most important, the Fiesers have interpreted their task so broadly as to have compiled a treatise on organic-chemical methodology rather than a mere index. It is, of course, unusual to find organic synthesis organized in dictionary form. The result of this kind of arrangement is a book full of fascinating juxtapositions, and one which rewards the browser in the same way a good dictionary does. This volume will serve chemists well for many years to come.

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Medieval Astronomy

Ibn al-Muthannâ's Commentary on the Astronomical Tables of al-Khwârizmî. Two Hebrew versions, edited and translated, with an astronomical commentary, by BERNARD R. GOLDSTEIN. Yale University Press, New Haven, Conn., 1967. 418 pp., illus. $17.50.

The unique role of Arabic culture in the history of the Western world is nowhere more evident than in the story of the descent of science from the ancient Middle East to the quickened activities of Renaissance Europe. This is a story not too well known, though specialists have been sketching its development for at least a half century.

From the 9th to the 13th centuries Muslim Spain provided a meeting ground for Latin and Semitic learning. Here, where the two cultures touched and intermingled, facilitated by the intermediary scholarship of Christian and orthodox Jew, historians have located the bridges of continuity, not only linking the achievements of antique Babylon and Greece to the growth of modern science, but even uncovering connections with ancient India. The vehicle of such enterprise is invariably humanistic—surviving texts and commentaries, such as these before us, and their analysis. To this task the scholar must bring not only the traditional linguistic and historical skills but a full understanding of the science involved. This Goldstein has done in the translation of Ibn al-Muthannâ's Hebrew commentary on the no-longer-extant astronomical tables of the 9th-century astronomer al-Khwârizmî. In its alloy of Greek and Hindu astronomical methods, the text illustrates clearly the transit of Hindu astronomy to the West.

Operating from the two Hebrew versions of the text (both of which are translated into English in this volume) Goldstein directly elucidates its meaning and character. Though he succeeds thus in clarifying the contents of the work, his all-too-sparse introduction (nine pages in a volume of over 400) unfortunately does little to set the material on which he has labored so well into a full historical perspective. A broader essay on Islamic astronomy, even if it were limited to the relevant epoch alone, would have been very welcome indeed.

The relative paucity of such scholarship as we have here at hand has pre-