long been alive to the need and value of scientific research; while the chemical trades for the most part are so divided and individual in outlook that the various professional societies have had neither the influence nor the means necessary to enable them to take any large share in promoting research in connection with those industries." Simultaneously the council undertook a very important project—the formation of a register of all researches actually being conducted on the outbreak of the war. They have also been busy in forming standing committees to advise them on special subjects. One on metallurgy, one on mining, and one on engineering have been set up, with sub-sections of each; and others are in contemplation. The question of aid to research in educational institutions is likewise engaging them. It will thus be seen that they have broken a good deal of ground during the year. But their main task is still ahead; and on this they make some careful observations.

There are two aspects of it—on the one hand, the sheer deficiency of scientific research and training in the country, and on the other, the failure of manufacturers to appreciate the conditions under which science can help them. The first is to some extent a quantitative matter, upon which an increase of endowments can do a great deal. The second is very intricate, since there is no problem of industrial structure—whether the relation of firms to other firms, or that of firms to their employees—which has not its bearing upon it. The council point out that a state of things, under which a number of relatively small firms in a country are more bent on cutting each other's throats than on promoting the success of the national industry against organized foreign competition, can rarely if ever be conducive to scientific advance in an industry. A certain amount of willingness to pool researches and results is almost indispensable to such an advance; and the more there is, the more advance can be hoped for. Quoting a famous American example the council distinguish three sorts of laboratories which a trade requires: (1) An ordinary works laboratory, such as a firm needs for routine tests and controls; (2) an "efficiency" laboratory, studying improvements in products and processes; (3) a laboratory devoted to more fundamental research, whose fruit is less immediate, though over long periods it will prove supremely important. Only a very large firm or else a combination of firms can be expected to undertake all three; and thus the future of industrial science is very closely linked to that of industrial combination. Another factor upon which the council lay hardly less stress is that of solidarity between firms and their employees, such as only a thoroughly generous and enlightened treatment of the employees can secure. It is not an accident that the firms which have been most conspicuous in the world for their scientific advances—such as the Carl Zeiss firm of Jena—have also been most conspicuous for enlightened and generous conditions of employment. The connection between "welfare work" and a more scientific industry is close and vital.—*The London Daily Chronicle.*

SCIENTIFIC BOOKS

The Turquoise. A Study of its History, Mineralogy, Geology, Ethnology, Archæology, Mythology, Folklore and Technology. By Joseph E. Pogue, Ph.D. Third Memoir, Vol. XII., National Academy of Sciences, Washington, D. C., 1915. Pp. 162. 22 plts. 4to.

While not ranking in intrinsic value with the precious stones *par excellence,* diamond, ruby, sapphire and emerald, no gem-material has longer enjoyed favor for personal ornament than the beautiful turquoise. Three thousand years before the beginning of our era, the Egyptians adorned their jewels with turquoise from the mines of the Sinai Peninsula, from very ancient times the famous Persian deposits at Nishapur have yielded material of the finest quality to the Orient, and in our own land, for the aborigines of the southwest and for the Aztecs of Mexico, the turquoise was at once a gem of exceptional beauty and one to which they attributed talismanic powers.

Hence it is that no more attractive subject for a monograph can well be imagined than the history and study of the turquoise, and

specialists as well as general readers are to be congratulated that this subject has now been adequately treated in all its manifold aspects by one so thoroughly qualified for the task as Dr. Joseph E. Pogue. The writer has disposed his material very systematically and logically. The first chapter (pp. 9–22) is devoted to the history of the stone and embraces a series of citations from early writers, both classical and Oriental, in chronological order. This is followed by a short chapter on the mineralogy of the stone (pp. 23–27). The localities where turquoise has been found are enumerated and fully described in the next chapter (pp. 28–59). To the geological side of the subject is devoted the fifth chapter, on the origin of turquoise. The four remaining chapters deal, respectively, with the use of turquoise (pp. 68–104), the chalchihuitl question (pp. 105–109), the mythology and folklore of turquoise (pp. 110–128), and the technology of turquoise (pp. 129–136). There is also a very copious bibliography, embracing over a thousand titles (pp. 137–154), and an excellent index (pp. 155–161).

The turquoise mines of the Sinai Peninsula, the oldest in the world, were worked from about the time of the I. Dynasty (about 4500 B.C.)[1] to the reign of Rameses VI. (1161–1156 B.C.), since which time turquoise does not appear to have been much used in ancient Egypt. The ancient mines in the Wady Maghara were rediscovered in 1845 by Major MacDonald, a British cavalry officer. The Egyptian name may have been *Mafek* or *Mafkat,* although this word appears rather to have designated malachite and other green stones. The writer of the present notice has conjectured that the *shoham* stones of the breastplate and on the shoulders of the Hebrew high priest may have been turquoises.[2] Strange to say a similar uncertainty hangs over the question whether Pliny's *callaina* means malachite or turquoise. Here again, although Pliny apparently wishes to describe a green stone, the word or a variant (also used by Pliny) *callais* came to mean the stone later called turquoise. A very probable conjecture accepted by Dr. Berthold Laufer, is that Pliny's sky-blue jasper (jaspis aerizusa) is the turquoise.[3] As an aid to the study of the early mentions Dr. Pogue has given a great number of passages referring to the turquoise, from classical and Oriental writers, in translation, although we must bear in mind that in some cases the English rendering "turquoise" is not certainly the meaning of the foreign original. The earliest use of this name, signifying that the stone was brought by way of Turkey to western Europe, is in the Latin gem-treatise of Arnoldus Saxo, written in the early part of the thirteenth century.

In the New World, among the Aztecs, the name *chalchihuitl* seems to have been applied to both green and blue stones, as with the other designations we have noted, and undoubtedly some chalchihuitls were turquoises. Of its use in decoration by the ancient Mexicans, certain curious masks, inlaid with this stone, offer incontrovertible evidence. The finest of these are in the Christy Collection of the British Museum (see Plate 15 of Dr. Pogue's book). Full descriptions are also given of typical turquoise-incrusted or decorated ornamental objects and jewelry made in later times by the Pueblo Indians and by the Navajos of Arizona and New Mexico.

The details as to turquoise mining in our day at the old Nishapur deposits are very interesting and valuable (pp. 37–39). The output is carefully classified into three categories, the first-class material, being called *Angushtari,* literally, "ring stones"; large pieces of this have brought as much as $1,500, and pieces no

[1] The uncertainty as to the exact initial date of the I. Dynasty is shown by the difference in the figures given by leading Egyptologists. The latest date is that of Lepsius, 3892 B.C. Then come Brugsch Bey with 4400 B.C., Flinders Petrie with 4777 B.C., and Mariette with 5004 B.C. Champollion, the father of Egyptology, even gave 5867 B.C., as the opening date. Brugsch Bey states that turquoise was already mined in Egypt in 4000 B.C., during the III. Dynasty, at the time of King Snefru, and that mining was not carried on later than the reign of Rameses II., 1300 B.C.

[2] George Frederick Kunz, "Curious Lore of Precious Stones," Philadelphia and London, 1913, p. 299.

[3] Pogue's "The Turquois," p. 11.

larger than a pea may be worth $40. Each stone is separately and accurately appraised. The second-class material, *Barkhaneh,* is sold by weight, bringing at the mines from $25 a pound for the poorer quality, up to $450 for the best quality. The third class, *Arabi,* is only utilized in Asia, for inlaying, incrustation, and so forth, a lot of twelve pounds once bringing only $300. In the United States a mine in the Cerrillos district, New Mexico, is believed to have produced more fine turquoises than any other deposit, the finest specimens being only equalled by some from the Burro Mountains in the same state, and from Nevada.

Within the narrow limits of this notice we can only touch upon a few points suggesting the wealth of carefully selected and excellently arranged material that Dr. Pogue has so indefatigably assembled here. For ethnologists and students of folklore, the chapter on the mythologic and talismanic fancies connected with this "celestial stone" among many different peoples, will prove especially interesting and instructive. The many plates are well selected to illustrate the subject and are clearly and effectively printed.

Certainly no one who acquires this book will fail to find it all, or more than all, that he expected, and we think that the thanks of those interested in the subject are due to the National Academy of Sciences and to the scholarly author, for having thus enriched our precious-stone literature.

It is very rarely that all the citations relating to a given subject are quoted in extenso, giving the exact and full reference. To the student and scientific worker this is of inestimable value, because frequently when only partial quotations are made, and the references are even inaccurate, much time is consumed in searching for an item which it is almost impossible to locate. What a great assistance it is, particularly to delvers in scientific fields, when, without loss of time in going from one library to another, all the data on a certain subject are found under one cover and immediately at hand. This has been made possible through the far-sighted policy of the National Academy of Sciences, and is especially exemplified in their publication, Volume 13, a catalogue of the Meteorites of North America, dated January 1, 1909, by Oliver Cummings Farrington. These two memoirs, in the presentation of their rich references with the deductions of experienced workers, are noteworthy contributions to two subjects, than which there is probably none of greater interest to the archeologist, petrologist, chemist, student and general worker.

George F. Kunz

The Mythology of All Races. In thirteen volumes. *North American.* By Hartley Burr Alexander, Ph.D., Professor of Philosophy, University of Nebraska. Volume X. Marshall Jones Company, Boston, Mass. 1916. Pp. 325, 23 full page and 2 text illustrations, linguistic map, 45 pp. Notes, 11 pp. Bibliography, authorities used.

Volume X. is one of the two volumes recently published of a series, the purpose of which, as stated by the editor, Dr. Louis Herbert Gray (Vol. I., p. xii), is to assemble "into a single unit" the mythologies of all races and "since the series is an organic unit—not a chance collection of monographs—the mythology of an individual race is seen to form a coherent part of mythology."

With this plan before him, Professor Alexander in Volume X. has not presented a collection of mythic stories drawn from a continent of varied aspects and conditions, but has aimed to show, as far as present knowledge will permit, the contribution that North America can offer to a world study of mythology. In the preface, he says of his subject: "The literature, already very great, is being augmented at a rate hitherto unequaled, and it is needless to say that this fact alone renders any general analysis at present provisional. As far as possible the author has endeavored to confine himself to a descriptive study and to base this study upon regional divisions."

The territory and the peoples of America north of Mexico he divides into seven regions: (1) The Far North, (2) The Forest Tribes, (3) The Gulf Region, (4) The Great Plains, (5) Mountain and Desert, (6) The Pueblo