one of Great Britain's famous prime ministers failed.

It is quite generally known that the Right Honorable Wm. E. Gladstone was an eminent Greek scholar, regarded as an authority in university circles. It is not so generally known that on one occasion he went to Athens to deliver an address in Greek. It was a long speech seemingly full of eloquent and loud-sounding periods. The audience applauded vigorously, but the applause was due to politeness, not comprehension, as those present thought that the orator was speaking English.

Each commencement we behold some vacant-eyed youth crowned with a *summa cum laude* in Greek, and we wonder as we look at him if he should be dropped down in some corner of Greece, whether he could tell the natives his name and where to take him.

ALEXANDER MCADIE

QUOTATIONS

MEDICAL RESEARCH IN INDIA

THE committee on retrenchment in India, over which Lord Inchcape presided, recommended, among other things, that the payment of research officers from central revenue should cease, and that the grant-in-aid to the Research Fund Association should be discontinued. The association had accumulated 33 lakhs, derived from the Government contribution and earmarked for a new central institute at Delhi; the committee advised that the interest on this sum should be used for the maintenance of medical research. The *Pioneer,* which is commonly credited with being well informed as to the intentions of the Government of India, stated in its issue of June 7 that it was understood that the Inchcape Committee's recommendations regarding the continuance of expenditure on medical research will not be accepted in their entirety. The adoption of the drastic proposals put forward by Lord Inchcape and his colleagues would, our contemporary continues, have involved "the virtual closing down of all research work in India, for, in the face of such a curtailment of activity, the chances of obtaining research workers in the future would have been small indeed. As it is, there is ground for the belief that the policy to be adopted will be that of securing a state of suspended animation. Thus instead of abolishing the appointments of twelve bacteriological officers, as recommended by the Retrenchment Committee, it is proposed to leave six of these appointments unfilled until financial conditions are more favorable. The establishment of a central research institute at Delhi and the grant of five lakhs a year to the Indian Research Fund Association are similarly suspended. This measure of retrenchment will be regretted, but it, at least, will not render the position hopeless, and it provides the retention of a nucleus for expansion when the occasion is suitable. The Directorship of Medical Research has been abolished for the time being, but arrangements are being made for that officer's duties to be carried on departmentally." The *Pioneer* goes on to express the opinion that if its prognostications prove to be correct, the Government of India has been able "successfully to temper its obsession on the subject of retrenchment with a due appreciation of the vital importance of medical research in a country like India." We can only express a fervent hope that this interpretation of the situation may prove to be correct; it does not seem to be a particularly courageous manner of dealing with a matter of so much importance. As we observed when the Inchcape report was first published, it is a paltry piece of economy to cut down the relatively small sum provided for the scientific study of the causes which lead to the high mortality among the 350 millions of the population of India. The amount represents an expenditure of about one twelfth of a farthing a head a year. The wisdom and policy of establishing a central medical research institute at Delhi is, we admit, open to doubt; it may be very much wiser to subsidize provincial institutes and special inquiries. It is easier to destroy than to build up, and even if a nucleus be retained the loss of experienced workers can hardly fail to make the eventual expansion more difficult.—*British Medical Journal.*

SCIENTIFIC BOOKS

Minéralogie de Madagascar, Vol. I and Vol. II. By A. LACROIX. Paris, Augustus Challamel, editeur, Librairie maritime et coloniale, 1922; Vol. I, 624 pp., 27 plates, one physical map in colors; Vol. II, vii, 694 pp., 29 plates and 11 maps in the text, 4to.

THE "Minéralogie de Madagascar," by Prof. Alfred Lacroix, of which the first and second volumes have appeared, is one of the most comprehensive studies of its kind that has been published, and gives us a wealth of information regarding the mineralogy and petrography of France's great island colony.

The first volume is devoted to the geology of the island, the first chapter giving a general idea of its geography (pp. 1–18). In the second chapter (pp. 19–148) the various geological aspects are described at considerable length under the sub-headings, "Region of Crystalline Schists" (pp. 19–51); "Sedimentary Formations" (pp. 52–56); "Intrusions and Post-liasic developments," "Recent Volcanoes" (pp. 77–150). This is followed by a section devoted to the mineralogy of the island (pp. 151–604).

The second volume treats of applied mineralogy, mining, etc. (pp. 1–218), of lithology (pp. 219–576).

The writer begins by noting that, after New Guinea and Borneo, Madagascar is the largest island of the globe. It has an extreme length of 1580 kilometers (nearly 953 miles) and an extreme width of 580 kilometers (about 360 miles). Its area exceeds 600,000 square kilometers (231,660 square miles), while the area of France is but 212,659 square miles. The island was visited by the Arab travelers at an early date, and was known to Marco Polo, who wrote towards the end of the thirteenth century; he is said to be the first European or Asiatic author to use the name "Madagascar." Geologically, this vast area contains (1) a region essentially formed of the crystalline schists and eruptive intrusive rocks; (2) a region of sedimentary or volcanic rocks; (3) a small, but interesting zone, forming the eastern side of a narrow border of sediments and sand dunes. The crystalline massif, essentially mountainous, extends for nearly the entire length of the island.

Of the gems of Madagascar, the author notes that from its discovery the island was reputed to furnish gems, and in 1542 Jean Fonteneau, the second Frenchman to land there, declared that precious stones were to be found, while in 1658 Flacourt speaks of topazes, aquamarines, emeralds, rubies and sapphires, of course from hearsay. However, the mineralogist, Alfred Grandidier, who explored the island extensively in 1870, stated that the Madagascans had no idea of what a precious stone was, and that they only cared for colored glass beads. Indeed, Professor Lacroix says that the actual discovery of gem material hardly dates farther back than thirty years. In 1891, M. Grandidier gave the Muséum d'Histoire Naturelle in Paris some fine crystals of rubellite and a few small sapphires and zircons.

As a result of several years of exploitation, it can be said that the beryls are the finest of the Madagascar gems, and they now constitute the chief part of the precious stone product. Many fine blue beryls have been found, but the choicest are unquestionably the cesium beryls of a peach-blossom pink hue, the type on which the writer of the present notice has bestowed the name "morganite." These and other of the beryls of greatest density are found in the sodolithic pegmatites, and since the deposits of Maharitra have become exhausted, the beryls now in commerce come principally from the eluvions of Anjanabonoina. In the British Museum there is a splendid cut beryl from Madagascar, weighing 600 carats, with a density of 2.835, and the American Museum of Natural History in New York owns a magnificent cut example of the morganite type, weighing 57½ carats, the density being 2.827. Professor Lacroix believes that both of these came from Anjanabonoina. He also believes that he was the first to have Madagascar stones cut, at the time the products of the island were exhibited in the Muséum d'Histoire Naturelle. These gems were chrysoberyls, garnets, corundums and topazes. Tourmalines occur in great variety (Vol. I, pp. 411–442; Vol. II, pp. 92–95) and of many beautiful hues, the red variety (rubellite) being the most precious. Specimens from Antandrokomby, Ampantsikahitra and other localities have furnished fine gems. Those of a golden yellow or a lemon-yellow are among the most characteristic; these are found principally in Tsilaizina. A number of exceptionally fine examples of lithia tourmalines are shown on Plate 9, Vol. II. The long list of Madagascar gem stones includes the following: beryl, tourmaline, both in a great variety of colors, kunzite, garnet, spinal, chrysoberyl, zircon, cordierite, diopside, amethyst, smoky-quartz and rock-crystal, opal and also kornerupine, danburite, scapolite and a beautiful ferriferous orthoclase.

Rock-crystal in remarkably fine specimens, rivalling those from any other source, have been found in Madagascar, which have been splendidly utilized in the ornamental arts. Fine examples of these crystals have been figured in Vol. I, plates 5 and 6. Large crystals have been utilized for several centuries for art objects and ornaments, and many of the artistic cups in our museums have been made from rock-crystal of Madagascar, which rivals that from Brazil in this respect. It is also employed for spheres, seals, boxes, perfume phials and for the pendants of chandeliers (Vol. II, p. 112).

The upright stones, called *vatomitsangana* (literally "standing-stone"), or *vatolshy* ("male-stones") in the Androy district of Madagascar (Vol. II, p. 169, Plate 18, opp. p. 166), are granite or gneissic monoliths erected in memory of a relative whose remains do not rest in the tomb of his ancestors. They are sometimes used as altars before which the natives offer prayer, and they anoint the sides of the stones with grease and place quartz pebbles on the summit. In size they vary from an average of two meters (6½ feet) to five meters (nearly 17 feet) in height, with a width of 50 or 60 centimeters (20 to 24 inches) and a thickness of from 25 to 30 centimeters (10 to 12 inches).

Danburite has been found in the pegmatites of Maharitra and in the eluvions of Imalo, in crystals sufficiently transparent to warrant cutting. They make a gem of madeira-yellow of various intensities, possessing properties closely similar to those of the topaz. Professor Lacroix believes some of them have been already sold under that name; he secured from Maharitra a stone weighing over five carats, and in a lot of minerals from Anjanabonoina he came across two fragments of danburite of a magnificent golden-yellow. One of these has been cut and furnished a gem weighing about 13 carats (Vol. II, p. 103).

The ferriferous orthoclase of Madagascar is sometimes of a magnificent golden yellow and occurs in crystals weighing up to 100 grains; it furnishes cut stones of several grams, which make a very fine effect. The low degree of hardness does not permit the use of these for jewels in constant use, but nevertheless the stone can be utilized by jewelers. Perfectly clear crystals of fine color have sold for from 75 to 500 francs the kilogram (Vol. II, pp. 102, 103).

The transparent variety of kornerupine (prismatine) was found among some minerals gathered twenty kilometers east of Itrongay. It was in clear, isolated fragments of a deep olive-green, some of them four centimeters long, and was probably derived from a pegmatite rather than a gneiss. They furnish very beautiful cut stones. The polychroism is evident beneath a certain depth, and the tint varies a little according to the direction given to the table. The largest of several weighed 21 carats. The smallest stones, of a clear green, recall certain varieties of beryl and tourmaline (Vol. I, page 396; Vol. II, p. 102).

Professor Lacroix notes that among the cut tourmalines from Madagascar he has remarked the following colors (Vol. II, pp. 93, 94):

Red (rubellite): Magnificent stones varying from blood-red to vinous-red, sometimes with a violet tinge. Certain of them resemble rubies at Antandrokomby, etc.

Pink: Numerous varieties more or less pale; especially vinous-pink, salmon-pink, peach-blow color, recalling the tint of the beryls from the same region and also the burnt topaz. These are the predominant types at Maharitra.

Amethyst violet: At Anjanabonoina.

Golden-yellow to orange: These are the richest in manganese and the densest and most characteristic of Madagascar. Found, above all, at Tsilaizina.

Brown: Dark brown at Tsilaizina; coffee-colored and warm-browns at Anjanabonoina.

Grayish-brown, or smoky: Maharitra, Anjanabonoina.

Olive-green: Only furnish stones of inferior value. Maharitra, Anjanabonoina; much resemble the Brazilian.

Pale green: At Vohitrakanga, a variety, the olive hue of which recalls that of korneropine and some beryls.

Grass-green: A great range of shades, especially apple-green and grass-green, recalling some of the tourmalines from Maine. At Anjanabonoina, Maharitra. At Ankitsikitsika are some crystals half green and half red.

Blue: The indicolite variety is the most frequent. Maharitra. When very dark blue they have little commercial value.

Colorless: Madagascar furnishes probably the greatest number of fine, clear, colorless tourmalines, but they are rare. Maharitra, Anjanabonoina.

The statistics from 1897 to 1921 show that Madagascar yielded quite an amount of gold in that period, the total production being 42,129.95 kilos (1,354,579 ounces). For the past ten years or more there has been a steady falling off, from a maximum of 3,696.87 kilos (118,858 ounces) in 1909 to only 456.24 kilos (14,668 ounces) in 1921. The total value of this gold product was $27,989,147 for the twenty-five years, an average of over a million per year.

Graphite in considerable quantity has been mined on the island (Vol. II, pp. 148–155), and the exports have been quite important. The deposits occur in a great many localities; indeed, wherever there are gneisses, more or less graphite is to be found. The amount obtained varied much in the several years, reaching a maximum of 35,000 tons in 1917 and falling to about 4,000 tons in 1920. In 1917 the material brought 1,200 francs a ton in Marseilles.

Of the uraniferous minerals from which radium can be extracted, Madagascar furnishes a number (Vol. II, p. 132), for example, fergusonite, euxenite, samarskite, blomstrandite and three minerals special to the island, namely, betafite, samiresite and ampangabeite. There are also deposits of autonite and uranocircite. Of these the minerals which are economically important are betafite and euxenite, the former being much the most exploited; the largest deposit is that of Ambatofotsy (Vol. I, p. 386). Certain of these betafites have been worth as much as 15,000 francs a metric ton. These ores are sometimes sold according to the radium content, the unity being one milligram per ton, the value of this unit ranging from 100 to 200 francs.

The fourth section of the work is devoted to the lithology (or petrography) of the island, and Professor Lacroix states that the classification used is that which he has set forth during the past few years in his lectures at the Muséum d'Histoire Naturelle. He briefly summarizes it as follows:

The eruptive rocks are considered, not only from the viewpoint of their mineralogical composition and their structure, as in the classification of Fouqué and Michel-Levy, but account is taken of the relative quantities of their constituent minerals, and also of their chemical composition, this latter point being especially considered in the present work.

The rocks are divided into five great classes, based upon the nature of their white minerals (quartz, feldspars, feldspathoides). The first two comprise the rocks rich in quartz; the third class those rocks whose essential white elements are feldspars; the fourth is constituted by rocks in which the feldspars are accompanied by a notable quantity of feldspathoids (nephelines, leucitics), and, finally, the fifth class is reserved to the little group in which the sole white element is a feldspathoid. These divisions correspond to very important chemical properties, the excess of silica above the quantity necessary to enable the aluminum, joined with the requisite quantity of oxides, to form feldspars in the first two groups; the complete or approximate saturation of this silica in the third group, and its lack in the last two classes.

A very interesting part of the section "Lithology" is that devoted to comparison of the sodo-lithic pegmatites of Madagascar with those of other countries (Vol. II, pp. 334–362). This embraces a careful description of these pegmatites in New England and in California, the greater part of the deposits having been studied in 1888 and in 1913 (pp. 334–346); in the last-named year Professor Lacroix was actively engaged in completing the great collection of American gems so generously donated to the Muséum d'Histoire Naturelle in Paris by J. Pierpont Morgan. He was accompanied on several of his excursions by the writer of the present notice and by Mr. Howe. He notes the striking resemblances between the pegmatites of California and those of Madagascar, the association in both regions of lithia tourmalines, notably of rubellite, caesium beryls, kunzite and spessartite, and the existence of native bismuth, of maganocolumbite. On the other hand, mineralogical differences must be noted.

The special attention here given by Professor Lacroix to these analogous formations in the United States is well worthy of remark in view of the fact that in but too many mineralogical handbooks composed by Europeans rather scant notice is taken of the United States.

Within the restricted limits of the present review we can only indicate the chief divisions of the section Lithography in Volume II, as follows:

FIRST DIVISION, INTRUSIVE ROCKS

Chap. I. Quartzite Rocks, pp. 229–243.
Chap. II. Pegmatites, pp. 244–376.
Chap. III. Syenites and Nephelinic Syenites, pp. 377–397.
Chap. IV. Rocks with Plagioclase, pp. 398–438.
Chap. V. Deformations and Transformations of the Eruptive Rocks, pp. 439–455.
Chap. VI. Contact Phenomena of the Eruptive Rocks, pp. 456–472.

SECOND DIVISION, CRYSTALLINE SCHISTS

Chap. I. Gneisses and Micaschists, pp. 479–522.
Chap. II. Quartzites, pp. 523–539.
Chap. III. Essentially Magnesian Rocks, pp. 540–545.
Chap. IV. Essentially Calcareous Rocks, pp. 546–574.
Chap. V. Exclusively Ferriferous or Aluminous Rocks, pp. 575–578.

THIRD DIVISION, INTRUSIVE POST-LIASSIC ROCKS

Chap. I. Quartzite Rocks, pp. 579–604.
Chap. II. Syenites and Nephelinic Syenites, pp. 605–622.
Chap. III. Syenito-Theralitic Series, pp. 623–643.
Chap. IV. Rocks with Feldspathoids without Feldspar, pp. 643–648.
Chap. V. Plagioclasites, pp. 649–655.
Chap. VI. Contact Phenomena of the Intrusive Post-Liassic Rocks, pp. 656–666.

The third and concluding volume[1] of Professor Lacroix's great work has been received since the review of the first two volumes was in type. This comprises the following petrographic sections: Post-liassic Volcanic Rocks (pp. 2–66); Sedimentary Rocks (pp. 67–91); Alteration of Rocks (pp. 92–149); Sketch of the Leading Lithological Characteristics of the Island (pp. 151–224). This is succeeded by a division devoted to a comparison of certain eruptive regions with those of Madagascar (pp. 227–294), and in the following brief section (pp. 295–334) the writer has grouped, in alphabetical arrangement and as an appendix, a series of mineralogical items which did not reach him until the earlier volumes were in press. The volume then concludes with a Bibliography (pp. 335–349), and an extensive Geographical Index of about 70 pages, succeeded by a Geological, Lithological and Mineralogical Index (pp. 421–431) and 4 pages of Errata. This truly monumental work is destined to remain an authority for a very long time.

GEORGE F. KUNZ
NEW YORK

[1] Tome III. Lithologie, Appendice-Index Geographique; Paris, 1923, 437 pp.; 28 text figures, 8 plates, and a colored geological map, 4to.

SPECIAL ARTICLES

THE GENESIS OF NORMAL AND ABNORMAL CARDIAC RHYTHM

THE story of the development of the modern ideas concerning the cause of the heart beat constitutes an interesting chapter in medical history. Haller,[1] in 1757, was apparently the first to conceive that the rhythm of the heart was dependent upon the blood flowing through it. To quote:

> Qui hos experimentorum nostrorum eventus pensitaverit, is quidem non dubitabit nobiscum pronunciare, causam quae cor in motum ciet, omnino sanguinem venosum esse. Nam enata ea causa cor movetur, subtracta quiescit, diminuta motus cordis languet, aucta motus intenditur.
>
> Id si verum est, si porro cordis admotum major, quam aliorum musculorum, promtitudo est, si praeterea cordi perpetuus, dum vivimus sanguis advenit, non mirum est, perpetuum cordis motum esse.

Subsequently, in the early nineteenth century, arose the argument as to the neurogenic or myogenic origin of the beat with the evidence then considered to be in favor of the former. The work of Gaskell,[2] in 1881–83, cleared much of the confusion and laid the foundation for subsequent work by pointing out the control

[1] Haller, Elementa Physiologiae Corporis Humani., 1757, tome I, p. 493.

[2] Gaskell, *Journ. Physiol.*, 1883, *4*, 43.