distinct and clean-cut line, while the northern border was everywhere indefinite, gradually dying out at about 30° to the north of the zenith. During the course of the evening the luminous area varied in width from 10° to about 35°.

The aurora was remarkable on account of its unusual position, its rapid changes in brilliancy, and its varying shape. The color was a pale bluish-gray, no iridescence having been seen at any time. Moreover, there was no suggestion of streamers or rapidly-moving iridescent patches, often referred to as "merry-dancers." When the aurora was at its maximum brilliancy, only the stars of brightest magnitude could be seen in that region of the sky, and the "milky way" was rendered entirely invisible. Over nine tenths of the sky was cloudless throughout the evening; a trace of alto-stratus cloud having been visible above the northern horizon, and an equal amount of cumulo-nimbus cloud with distant lightning having been seen far off to the west.

Andrew H. Palmer
Blue Hill Observatory,
May 17, 1909

SCIENTIFIC BOOKS

Elements of Optical Mineralogy, An Introduction to Microscopic Petrography. By N. H. Winchell and Alexander N. Winchell. New York, D. Van Nostrand Company. 1908. Pp. 502; 350 figures; 4 plates. Price, $3.50.

During the last few years several excellent treatises on optical mineralogy by Americans have appeared, namely, those by Luquer, Iddings and Johannsen. According to the authors, none of these contains a concise and clear exposition of the principles, methods and data of optical mineralogy. It is to supply this want that this text was written.

The book is divided into three parts, as follows: (1) Principles and Methods, (2) Description of Minerals and (3) Analytical Tables.

In part one, seventeen pages are devoted to some of the phenomena of light, twenty-two pages to the elements of mineralogy, and fifty-nine pages to the application of polarized light to crystalline substances. Part two contains a systematic description of all the rock-forming minerals concerning which there is sufficient data to permit their being determined by means of the microscope. These descriptions occupy 310 pages. Part three is made up of exhaustive analytical tables for determination, microscopically, of rock-forming minerals. The tables extend over fifty-seven pages.

There are also three appendices, as follows: (1) Optical Study of Opaque Minerals —ten pages, (2) Microchemical Methods—nine pages, and (3) A Partial Bibliography—two pages.

There will be, undoubtedly, much difference of opinion among petrographers and physical crystallographers as to whether the authors have succeeded in presenting the principles and methods, fundamental to a clear understanding of the physical properties of rock-forming minerals, "concisely and clearly." To be sure, they have been treated concisely, but only in a few cases clearly. Thus, the description of the nicol prism, a thorough understanding of which is absolutely essential, is intelligible only to those who have had some previous knowledge of it and know what to expect. Certainly a beginner can obtain no clear conception of it. Furthermore, the description is not entirely accurate, as is shown by the following sentence, lines 7 to 10, page 16: "The cut faces, after polishing, are cemented together again in their original position by Canada balsam—*which has nearly the same index of refraction as the Iceland spar*" (the italics are the reviewer's).

The statement, page 8, that the most exact method of applying total reflection to the determination of the index of refraction is the Kohlrausch method, is misleading, as any one who has had experience in applying it knows. Line 9, page 9, should read "the axis of the observing telescope *OT* is the line of the *reflected* ray," instead of the incident ray. Fig. 3*c*, accompanying this description, is poorly executed, the line *ON* being by no means normal to the plate *OD*. In fact, many of the

drawings are not up to the usual standard, especially that set by German writers.

In the discussion of the elements of mineralogy a brief review of the essentials of crystallography is undertaken. It would seem that altogether too much space is given over to the calculation and projection of crystals and not enough emphasis placed upon a mastery of their general morphology. For after all, the petrographer is far more concerned about the general features of crystal form, as revealed in the thin section, than he is about the calculation to the fourth decimal place of the elements of crystallization.

In the chapter on the application of polarized light to crystalline substances the optical behavior and methods of determination of crystals are treated. In too many cases are the phenomena, to be observed, described without any attempt being made to explain them. This is especially the case with the discussion of the formation of uniaxial interference figures. The statement on page 46, "The student must keep in mind the principles of polarization of light as given in Chapter II.," needs to be corrected, as polarization is not at all referred to in the chapter indicated.

Parts two and three are the most important features of the text. The descriptions of the various minerals are in all cases full and include, aside from a discussion of the crystallographic, optical and other physical properties, paragraphs treating inclusions, recurrence, diagnostics and classification. Many figures showing the optical orientation accompany these descriptions. The discussion of the feldspar group is very exhaustive, covering forty-seven pages and including fifty-four figures. The analytical tables are well arranged and usually lead to a rapid and accurate determination of the mineral under consideration.

Although the authors have failed to present the principles and methods of optical mineralogy in a manner which will allow of a ready comprehension by the beginner, they have nevertheless succeeded in making easily accessible the more important data of rock-forming minerals. This feature alone is sufficient to commend the book to the use of advanced students of petrography and physical crystallography.

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Gold: Its Geological Occurrence and Geographical Distribution. By J. MALCOLM MACLAREN, D.Sc. Cloth, 6×10 ins., pp. 687. London, The Mining Journal.

Maclaren's "Gold" is a recent acquisition to a somewhat overworked field of endeavor. The work has been compiled, as such works must needs be, through much painstaking effort extending over a number of years; an important consideration being that a large part of the information presented has been verified by investigations made by the writer which add weight and authority to the statements.

The book is divided into two parts, namely, the General Relations of Auriferous Deposits and the Geographic Distribution of Gold. In the first part is a general discussion of the occurrence of gold, including a general statement regarding the structure of the earth and its relation to ore deposits. There is a brief discussion concerning the zone of fracture, sources of metallic ores and underground waters, filling of fissures, secondary enrichment, etc., but it is doubtful whether they should not have been discussed at greater length or not considered at all.

There is an interesting section devoted to a discussion of the physical and chemical characters of gold, its alloys and natural compounds.

The geological occurrence of auriferous deposits is taken up under the head of Classification of Deposits, which is divided into two groups, the primary and secondary, the occurrence by countries, districts, etc., being considered under these heads. It is needless to say that an attempt to cover the occurrence of gold throughout the world in seventy odd pages is much too big a task to be done comprehensively.

The bulk of the book is devoted to a discussion of the geographical distribution of gold, and while fairly exhaustive leaves much