causing larvæ of the human Agchylostoma to live for a time in puppies.

He has set himself the task of writing a life-history of *Agchylostoma duodenale* from a scientific point of view, and traces the development of the parasite outside the body, while he also conceives it to be his duty to censure many previous authors for their errors. He finds that nematodes may be kept unchanged for years in undiluted glycerine, and that their eggs and larvæ can be best preserved by using hot alcohol. In order to prevent the decomposition of fæces used as a culture medium, he recommends the addition of an equal part of powdered animal charcoal, for this mixture prevents harmful effects to the eggs and larvæ.

He disagrees with other observers who state that the mature embryo breaks the eggshell by knocking against it with its head and tail, for he finds that the shell bursts of itself, and in so doing throws out the embryo passively. The fæces of natives of warm climates present a more favourable medium for the development of larvæ than the excreta of those who live entirely on meat or on vegetables. Oxygen, a constant temperature which may, however, be as low as 50° F., or as high as 105° F., and moderate moisture are the factors necessary for the development of young larvæ, while the proper element for mature larvæ is water, which they eagerly enter as soon as they can, and in water they can live for months because they no longer require any food. Prof. Looss finds that sunlight alone does not act injuriously upon the eggs, provided the temperature is not also raised.

While studying the migratory instincts of larvæ in his laboratory in Cairo, the author, by a not unhappy accident, found himself infected by a drop of culture fluid containing some hundreds of lively larvæ, which fell upon his hand. Experiments patiently conducted on himself, on volunteers, and on young puppies eventually solved the mystery of how mature larvæ enter the skin, either by the hair follicles or by the horizontal fissures between the scales of the epidermis, and how they then migrate to the duodenum of the host. The time which elapses between infection by the mouth and the earliest date when eggs are found in the victim's fæces is thirty days, whereas in infection by the skin it varies from forty-five to seventy-four days. His great discovery of infection by the skin has of late years been amply confirmed by many observers. Among the most important we may mention Schaudinn, Lambinet of Belgium, and in America, Claude Smith, Stiles and Ashford and King.

Passages on which the author desires to lay emphasis appear, as in German literature, in large spaced print.

The plates from Prof Looss's masterly drawings have been faithfully reproduced in Frankfurt, and add considerably to the value of the book

THE MICROSCOPIC DETERMINATION OF MINERALS.[1]

THE identification of a mineral fragment by means of the microscope, to be beyond doubt, must be based upon some quantitative test, such as a measurement of the refractive indices, or, in the case of doubly refractive substances, the amount of double refraction and the relation of the extinction directions to the crystalline form, or, in that of biaxial substances, a measurement of the angle between the optic axes. Recent years have witnessed great progress in the discovery of more convenient or more accurate methods of effecting such measurements, and almost equal progress in the design of the instruments and accessory apparatus. So rapid has been the advance that it has outpaced the text-books. Petrologists and all who may have occasion to identify minerals from chance fragments will therefore feel grateful to Dr. F. E. Wright for the admirable treatise in which he describes in detail and discusses with critical acumen the various methods and devices available. Dr. Wright is himself responsible for no mean share in the progress that has been made, and it is an excellent feature of the volume that he is in a position to write of almost every method or piece of apparatus from first-hand experience in the Geophysical Laboratory; the pages, in fact, teem with those practical hints and suggestions which prove so useful to the worker.

The scope of the work is satisfactorily complete. A lengthy introduction includes an adequate discussion of the principles of microscopic vision so far as they apply to the particular case of the petrological instrument; the various aberrations and their corrections are explained, and descriptions are given of some recent instruments. It is pleasant to find that full credit is given to Mr. A. B. Dick for his invention of the system of simultaneous rotation of the polarising and analysing Nicols which has been adopted in all the best forms of petrological microscope; Continental writers have overlooked his incontestable claims to priority. Dr. Wright prefers an adaptation of Mr. Dick's first suggestion, viz. a vertical bar rigidly attached to the circles carrying the Nicols, instead of the system of gear-wheels in general use, fearing that the backlash in the latter might introduce appreciable error in delicate work.

The first chapter deals with the physical characters which do not entail measurement, such as colour, crystal habit, dispersion of the optic axes, &c. The fact that there is still no recognised standard for gauging colour is dwelt upon, and a description is given of the Ives calorimeter, which consists of three filters rotated by means of an electromotor, the depth of each tint being varied at will by means of movable shutters. Mention might have been made of the Lovibond tintometer, which is based on the same fundamental principle, and, though not so accurate, is a much simpler piece of apparatus. The difficulty of describing a tint is one that affects us all in our everyday affairs, and it would be an inestimable boon if precision could be given to the colour terms in popular use. In the second chapter we pass to the measurement of refractive indices. Thanks to Prof. Becke's discovery of the phenomenon known as the bright-line effect, it is possible to obtain a value which with care may be as accurate as two units in the third place of decimals; Dr. Wright adds the useful warning that the phenomenon may be masked if the dispersion of the mineral and the liquid differ considerably, as not infrequently happens. The announcement of the discovery of a new, highly refractive liquid, ranging from 1·790 to 1·960, will arouse great interest; it is a mixture of methylene iodide, antimony iodide, arsenic sulphide, antimony sulphide, and sulphur, but complete details are promised in a paper yet to be published.

In the third chapter the determination of double refraction by means of wedges, various forms of which are described, is discussed, and it is pointed out that the most serious source of error lies in the measurement of the thickness of the fragment under observation. In the fourth chapter the methods of determining extinction angles are discussed with a wealth of mathematical detail, which is of great help in understanding the phenomena presented. Atten-

[1] "The Methods of Petrographic-microscopic Research, their Relative Accuracy and Range of Application." By Fred. Eugene Wright. Pp. 204+11 plates+118 figs. (Washington, D.C.: Carnegie Institution of Washington, 1911.)

tion is directed to the simple, but not generally known, method of slightly revolving the upper Nicol when in or near the position of extinction.

The last chapter, on the optic axial angle, is in many ways the most interesting. It is now possible to obtain determinations in cases that would have been abandoned as hopeless a few years ago. When both axes emerge in the field of view the angle is usually measured by means of a linear scale in the eyepiece; Dr. Wright points out that, owing to the distortion introduced in the interference figure by the lens system the Mallard constant does not usually hold, and it is safer to calibrate the scale. Prof. Becke, with characteristic ingenuity, has recently shown that by mapping the brush in various positions a remarkably accurate value of the optic axial angle is possible, even when only one "eye" is visible; the method is fully explained and illustrated. For such work Dr. Wright uses a double micrometer eyepiece, but admits that a cross-ruled scale in the eyepiece is equally effective, a device that has been in use some years. Dr. Wright recommends for graphical work the little known Postel projection, in which the eye is situated at such a distance from the sphere that the distortion in polar directions is reduced to a minimum, and in tangential directions does not exceed the ratio of $\pi/2$; the awkwardness of the shapes of the great and small circles, however, militates against its use.

Prof. Fedorow's universal stage, the invention of which placed an invaluable weapon in the hands of petrologists, and enables them to measure the angle between the optic axes and determine their positions with respect to the section, even when no "eye" is visible, is also fully discussed. At the close of the chapter Dr. Wright very carefully considers the accuracy of which the several methods are capable. Some novel diagrams will be found on the plates at the end of the book; neither of the diagrams representing the equation $\sin i = n \sin r$ is, however, as simple as the graph devised by Mr. Hutchinson, in which the sines of the angles are taken as co-ordinates. An excellent index greatly adds to the value of the volume.

SMITHSONIAN EXPEDITIONS.

THE Smithsonian Institution has just issued a pamphlet describing, in part, the expeditions which it has organised or participated in during the field seasons of 1910–11, covering a wide variety of investigations conducted both in the United States and abroad. During the past two years the institution has been represented in eighteen different exploration and field parties. The scope of these activities has been world-wide, but more recently especial attention has been directed to Africa and the Panama Canal Zone.

Unfortunately, as the regular resources of the institution are not sufficient to carry on extensive field explorations, it is often compelled to confine its efforts to investigations of limited scope, but of such a nature as to bear directly on the progress of science. In this connection it has been fortunate in securing the cooperation of a number of public-spirited citizens and scientific institutions, as well as several branches of the United States Government.

The Smithsonian African Expedition had scarcely returned from the field when the institution received invitations to participate in two others, organised to explore the same general region. The first was Mr. Paul J. Rainey's hunting trip to British East Africa and southern Abyssinia, where Mr. Rainey especially arranged to hunt lions with a pack of American foxhounds. The natural history collections that might be secured were offered to the Smithsonian Institution, provided an expert field naturalist be sent to accompany him and prepare such of the game collected as was desired for exhibition or scientific study. Mr. Edmund Heller, who had accompanied the Smithsonian African Expedition in such a capacity, was selected, and departed with Mr. Rainey in February, 1911. The collection made has been estimated to contain some 4700 skins of mammals, together with many birds, reptiles, &c., and supplements the present African collection to a great extent. Nearly all of the material is from localities not covered by the earlier expeditions, and some of it comes from points never before visited by naturalists.

The other natural history expedition was that of Mr. Childs Frick, of New York, whose object was to secure a collection of animals from the territory lying to the north of the regions visited by the earlier Smithsonian expedition and that of Mr. Rainey, covering at the same time certain parts of Abyssinia, northern British East Africa, and the country lying about Lake Rudolf. As naturalist of this party, Dr. Edgar A. Mearns, of the Smithsonian African Expedition, was chosen. A portion of the collection of birds is to be donated to the Smithsonian Institution by Mr. Frick, and already several hundred specimens have been received.

During the summer of 1911, Mr. Charles G. Abbot, director of the Smithsonian Astrophysical Observatory, and Prof. F. P. Brackett, of Pomona College, California, made a series of observations on the radiation of the sun at Bassour, a small town about sixty miles south-west of Algiers, and secured a large amount of data for comparison with simultaneous observations taken by Mr. L. B. Aldrich at the Smithsonian observatory station on Mt. Wilson, California.

An expedition to South America, for the purpose of studying the material relating to the antiquity of man in that region, was conducted by Dr. Ales Hrdlicka, curator of physical anthropology, United States National Museum, and Mr. Bailey Willis, of the U.S. Geological Survey. The expedition collected many interesting geological, palæontological, and anthropological specimens, which have been turned over to the National Museum for identification and description, but the evidence gathered does not seem to sustain a large part of the claims regarding the antiquity of man in that region, which had been previously asserted by various authors.

While in this part of the continent, Dr. Hrdlicka also visited the ruins of the city and temples of Pachacamac, Peru, where he made personal researches and studies in archæology and ethnology. His complete report on the antiquity of man in South America is made in Bulletin 52 of the Bureau of American Ethnology, now in press.

In 1910 the institution organised a biological survey of the Panama Canal Zone, with the cooperation of the Departments of State, Agriculture, Commerce and Labour, and War. At first it was intended to confine the collections to the Canal Zone proper, but as the natural and floral areas extended to the north and south of this region, it was decided to carry the work into the Republic of Panama, a step which met with the hearty approval of that Republic. The work accomplished during the season of 1910 and 1911 related to vertebrate animals, land and fresh-water molluscs, and plants, including flowering plants, grasses, and ferns.

Another expedition in which the institution co-operated was that organised by the United States Bureau of Fisheries and the American Museum of