procurable crystals for his investigations, and, if they are artificial chemical preparations, if he has followed and makes use of the recent work on the preparation of perfect individual crystals, and the precautions to be taken to avoid disturbance during growth, there will be a very different story to tell, and the deformations, striations, curvings, and lack of constancy of ten minutes or more will all disappear, and the angles will inform him, if he employs the most accurate goniometer in the market, of their constancy to the last minute. To speak, moreover, of "petites dimensions" as being a drawback is even more enlightening as to the author's lack of familiarity with practical crystallography. For it is precisely small crystals, varying from a very small pea to a pin's head in size, that the crystallographer chooses by preference for his measurements. For the liability to distortion is then at its minimum.

Sufficient will have been said to indicate the excellences and the defects of this volume, both striking in their way. Indeed, in spite of the aggravating defects which it has been essential to point out, the writer possesses so original and lively a style, and his remarks are often so well worth reading, that with all its shortcomings, the book has good and valuable qualities, and in the portions where the author is on his own domain is both well written and instructive.

A. E. H. TUTTON.

THE ORIGIN OF THE DIAMOND.

Diamonds. By Sir William Crookes, F.R.S. Pp. xvi +146. (London and New York: Harper and Brothers, 1909.) Price 2*s.* 6*d.* net.

ALL who have had the pleasure of hearing Sir William Crookes's lectures on the diamond and its origin will be glad to find the valuable information contained in them put into a permanent form in the little book before us.

The author has had exceptional opportunities for studying the subject. During two visits to South Africa, in 1896 and 1905, he was allowed by the managers of the De Beers mines to have unrestricted access to valuable sources of information; and, as is so well known, his own physical and chemical researches have been largely concerned with questions connected with the properties and origin of the most remarkable, as well as the most highly prized, of the gems.

Concerning the Kimberley diamond mines, as well as the alluvial deposits of South Africa, Sir William Crookes can write with authority from his personal observations. As illustrating "the kind of speculative gambling" which goes on in the former class of workings, we are told of a claim where the owner had not seen a diamond for a fortnight, but just before then he had picked out a diamond worth 300*l.*! On the other hand, the systematic work at the mines of the De Beers Company enables the management to regulate the annual supply with the greatest nicety, so as not to cause any fall in the price of the gem. In 1907 more than two and a half million carats were raised, which realised 6,452,597*l.* The mode of occurrence of the diamonds, the methods of working adopted at different times in the wonderful pipes that yield the gems, and the ingenious methods of treating the "blue ground" and sorting out the stones, are described and illustrated by photographs taken by the author himself.

Sir William Crookes had the opportunity of handling and taking a photograph of the celebrated "Cullinan diamond" before it was cut, and his description of it is of much interest. He tells us that:—

"A beam of polarised light passed in any direction through the stone, and then through an analyser, revealed colours in all cases, appearing brightest when the light passed along the greatest diameter—about 4 inches. Here the colours were very fine, but no regular figure was to be seen. Round a small black spot in the interior of the stone the colours were very vivid, changing and rotating round the spot as the analyser was turned. These observations indicated internal strain. The clearness throughout was remarkable, the stone being absolutely liquid like water, with the exception of a few flaws, dark graphitic spots, and coloured patches close to the outside. At one part near the surface there was an internal crack, showing well the colours of thin plates. At another point there was a milky, opaque mass, of a brown colour, with pieces of what looked like iron oxide. There were four cleavage planes of great smoothness and regularity. On other parts of the surface the crystalline structure was very marked. The edges were rounded in parts, and triangular markings (depressions) were to be seen. I also noticed square depressions, nearly as sharp and perfect as the triangular ones."

Interesting as this description undoubtedly is, we cannot but regret that, before this unique specimen was deprived of its interest for mineralogists by being cut, no opportunity was afforded to the author, or any other scientific investigator, of carrying out such a series of observations in the laboratory as would have enabled him to place on record all the facts about it which it was desirable to obtain.

A full account of the Cañon Diablo meteorite, with its enclosed diamonds, and of the vast crater-like depression in Arizona where it was found, is given in the concluding chapter. The author, in discussing the genesis of diamonds, is clearly of opinion that, whether of inter-terrestrial or of extra-terrestrial origin, the conclusion is established, both by observation and experiment, that the solvent from which the carbon has crystallised must have been molten iron.

In conclusion, we cannot but commend, to all desirous of learning what is known about the most beautiful and interesting of gems, this terse and attractive—but withal trustworthy and complete—summary of all the information on the subject which has up to the present been acquired.

J. W. J.

DIFFERENTIAL GEOMETRY.

A Treatise on the Differential Geometry of Curves and Surfaces. By Prof. L. P. Eisenhart. Pp. xii + 474. (London and Boston: Ginn and Co., n.d.) Price 20*s.*

THE well-known works of Darboux and Bianchi are so excellent, each in its own way, that one might be inclined to doubt whether another text-book on the subject was really required—at least, for the

present. But Prof. Eisenhart's work will be acceptable to those who prefer English to other tongues, or who wish to have the main results in a more condensed form than that in which Darboux and Bianchi present them.

The author of this book has been remarkably successful in giving a large amount of matter without an appearance of stodginess. The main reason for this is that, besides having a crisp style, he is very judicious in omitting those links of connecting analysis which the reader can easily supply for himself, or take for granted as calculations which have been done once for all. Without any attempt to enumerate even all the principal topics discussed, it may be said that we have a sufficient account of curvilinear coordinates, conformal and other representations, differential parameters, and the Christoffel (or Riemann) symbols; chapters on the deformation of surfaces, including Minding's problem, and the method of Weingarten; a very compact account of geodesics, minimal and other special surfaces; and finally chapters on rectilinear congruences, cyclic systems, and triply orthogonal systems of surfaces. Incidentally, many elegant special applications are given; thus, for instance, there are several interesting theorems due to Bonnet.

One remark is almost sure to occur to the reader of the book, namely, that the use of the differential parameters of the linear element is, in some parts of the theory, a very powerful engine, at any rate, for purposes of condensation and lucidity. An instance of this will be found in the chapter on geodesics (pp. 215–8). No serious student of differential geometry can fail to read Gauss's famous memoir and the early papers by Lagrange and others on minimal surfaces; few things are more instructive than a comparison of these "path-breaking" memoirs with the compact and symmetrical methods of the present day. The contrast is so great that the student who hopes to do something himself is more than ever bound to read original papers besides text-books and treatises; otherwise he will be tempted to imagine that new results fall out of the sky, so to speak, in their final and clearest and most elegant shape.

Fortunately Prof. Eisenhart's book contains a partial antidote in the shape of a very useful collection of unsolved examples. These are of all grades of difficulty, ranging from simple corollaries to adjacent bookwork to important theorems extracted from original papers. It would, perhaps, have been a help in these latter cases to give a reference; but the author has been sparing in his bibliography, as indeed mathematical writers can now afford to be, when the "Encyclopædie d. Math. Wiss." and the Royal Society's "Subject Index" are available.

In conclusion, a word on notation may be permitted. The Christoffel symbols are so essential in some parts of the theory that they ought to be of a simpler character than they are; for instance, the formulæ on p. 155 may, in a sense, be expressive, but they are cumbrous and ugly in the extreme. Could not the Mathematical Congress, or some other body, suggest a simplified notation, with some chance of its being generally adopted? G. B. M.

THE INSPECTION OF FOOD.

Food Inspection. By Hugh A. Macewen. Pp. viii + 256. (London: Blackie and Son, Ltd., 1909.) Price 5s. net.

THIS work has been written with the object of giving a clear and concise account of the inspection of meat and other foods, and of the principles underlying the hygienic production of prepared foods. It embodies the author's personal experience of the methods employed in Berlin and other German towns, America, and Great Britain. The book, which is well illustrated, includes chapters upon meat inspection; the inspection of live animals, and the symptoms of the more important diseases from which they suffer; the methods of slaughter; the diseases commonly met with in the abattoir; the construction and management of slaughter-houses and abattoirs; the inspection of fish, poultry, game, fruit, and vegetables; the preservation and storage of food; the inspection of prepared foods; and the law relating to the above subjects. In the anatomical description given the ox is taken as the type, and whenever any of its organs or parts differ markedly from those of other animals which concern the meat inspector, a special description is given. Important anatomical facts include a clear statement and good illustrations of the situation of the principal lymphatic glands in cattle and pigs.

An interesting and useful appendix deals with the German method of meat inspection as carried out in Berlin, and another appendix furnishes a short description of Chicago stockyards and packing-houses, and of American methods of meat inspection. The writer condemns the private slaughter-house which is so general in this country. If inspection is to be efficient it is essential that the inspector should be present while the slaughtering is going on. This is impossible in all the private slaughter-houses; and therefore no adequate system of meat inspection is possible where they are suffered to exist. The organs of unsound animals may be concealed or destroyed before the inspector appears on the scene, and the writer testifies to the fact that there is often a marked want of cleanliness in the methods of dressing and preparing the meat in private slaughter-houses, which is not to be witnessed in public abattoirs.

The work will not serve as a reference book. The information offered is not comprehensive enough for that purpose; but it is admirably designed to provide what the average food inspector and public-health student requires from a text-book. In parts the matter will be judged by the medical reader as very elementary, but the book has been written mainly to meet the needs of non-medical readers; the former, however, will find a very great deal to interest and instruct. Indeed, it may be read with profit by all who are interested in the public food supply, and it will probably prove to be the most serviceable text-book which candidates preparing for the examinations for the food inspector's certificate, granted by the Royal Sanitary Institute and other bodies, may consult. Both in respect of the matter it contains and