

hospital consisted of two divisions similar in every respect, except that in the first division the women were attended by the students and in the second division by midwives. Semmelweis found, over a period of five years, that the mortality in the first division remained three times as high as that in the second. What was the cause of this? A significant entry occurs in his note-book:—"All is doubt and difficulty. Only the great number of the dead is an undoubted reality."

In 1847 Semmelweis's friend Prof. Kolletschka died of septicæmia from a scratch on the finger received at a *post-mortem* examination. The circumstances of this tragedy, its origin from the introduction of a poison into a wound surface, the course of the illness, and the pathological results revealed by examination of the body after death brought illumination to Semmelweis. This was a similar condition to the "fever" of puerperal women; both were due to inoculation of putrid organic matter, hence the terrible mortality among women attended by students fresh from the mortuary and the better results obtained by the midwives. In 1847 "the eternally true doctrine" was announced, but no wide publicity was given to it, and it failed to obtain general acceptance. Had Semmelweis been a ready speaker or writer, had his personality been different, more ambitious, perhaps even more winning, the great truth might have been accepted by the profession. Instead of this he died unrecognised, after years of embittering and acrimonious discussion. Sir William Sinclair's book is of the greatest interest, and we are glad to welcome an adequate English appreciation of Semmelweis, who certainly ranks among the "heroes of medicine."

NON-EUCLIDEAN GEOMETRY.

The Elements of Non-Euclidean Geometry. By Dr. J. L. Coolidge. Pp. 292. (Oxford: Clarendon Press, 1909.) Price 15s. net.

THIS work will be found really valuable by all students of geometry, especially by those who know little or nothing of the non-Euclidean theories. First of all we have a discussion of the elementary axioms; in this the plane is deduced from what may be called a triangular frame, in the manner of Peano and Schur. Then comes the discrimination of the three cases; according as the sum of the angles of a plane triangle is equal to, greater than, or less than two right angles; and this is followed by the fundamental trigonometric formulæ for a triangle, deduced very neatly from Saccheri's isosceles birectangular quadrilateral. It is also proved at this stage that the non-Euclidean plane can be developed upon a surface of constant curvature in Euclidean space.

The author next proceeds to a discussion of higher spaces (in three dimensions), the absolute, and groups of congruent transformations. The treatment here is entirely analytical, and for the beginner, at any rate, this is doubtless the proper course to take. In fact, most will feel that the analytical treatment of the subject has the great advantage of preserving us from fallacies and vicious circles.

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The next chapters contain developments relating to curves and surfaces of the first and second orders; in particular, there is an interesting chapter on the higher line-geometry. In some respects this is analogous to Staudt's representation of an imaginary line of the second kind; but it should be said that there is only a very brief sketch (pp. 127-30) of the interpretation of imaginary coordinates in non-Euclidean space.

The chapter on areas and volumes is remarkably good and clear. The formula for the area of a triangle is obtained by a method which is both elementary and rigorous; and there is a very interesting discussion of the volume of a tetrahedron.

Chapters xv. and xvi. are on differential geometry, and here again the treatment is admirable. For one thing, the quantities usually denoted by D , D' , D'' present themselves in a natural way instead of resulting from a long and tedious calculation. Among the prettiest results of these chapters are the extensions of Meunier's theorem and of Gauss's theorem on the total curvature at any point on a surface.

There is a brief discussion of multiply connected spaces, and two final chapters, each of which is, in fact, an independent presentation of the subject, one from the projective point of view, and the other, like that of Riemann's famous essay, based on the properties of a quadratic differential form. The reader cannot fail to profit from these various ways of regarding the subject; their agreement in results will help to free him from the natural prejudice which many entertain—that non-Euclidean geometry is a mere juggling with symbols, having no relation to the properties of space as it actually is. After the recent critical work on the foundations of geometry, the conclusion is inevitable that there are no grounds at present, and probably never will be, for asserting that the space of physical phenomena is Euclidean or non-Euclidean; while in the realm of speculation the three kinds of space are coordinate, and equally possible.

G. B. M.

COLOUR PHOTOGRAPHY.

Über Farbenphotographie und verwandte naturwissenschaftliche Fragen. By Prof. Otto Wiener. Pp. 88. (Leipzig: J. A. Barth, 1909.) Price 2.40 marks.

THERE is, perhaps, no more remarkable recent scientific achievement than the realisation of the problem of photography in colours, which has occupied the thoughts and aspirations of many workers since the day when Nicéphore Niépce, the founder of photography, told the Marquis de Jouffroy that one day he would reproduce his likeness just as he saw it in a mirror.

In this reprint of a discourse on colour photography and kindred physiological questions, delivered at the Congress of Naturalists in Cologne in September, 1908, Dr. Otto Wiener has given a brief sketch of the principles of the various methods of colour photography, with additions, chiefly of omissions from the discourse itself, together with copious notes and references to the literature, and further details of the