

mathematical thought and enter the region of metaphysics. Like other lines of reasoning which have occupied us in former chapters, the exact and rigid definitions and deductions of arithmetic and geometry lead us up to that other large department of our subject—philosophic thought. Many eminent mathematicians of recent years have noticed this tendency, and have urged the mutual help which arithmetic and geometry on this side, logic and psychology on that, may derive from each other. The names of Helmholtz, Georg Cantor, and Dedekind in Germany; of M. Tannery and M. Poincaré in France; of Peano and Veronese in Italy, stand prominently forward abroad; while England can boast of having cultivated, much earlier, by the hands of De Morgan and Boole, a portion at least of this borderland, and of having in recent years taken up the subject again in an original and independent manner.¹ Cayley, in his address to the British Association in 1883, has said: “Mathematics connect themselves on the one side with common life and the physical sciences; on the other

¹ I refer to the important but unfinished works of Mr Whitehead on ‘Universal Algebra’ (vol. i., 1898), and of Mr Bertrand Russell on ‘The Principles of Mathematics’ (vol. i., 1903). I must defer a more detailed appreciation of these and other writings of this class, such as those of the late Prof. Ernst Schröder (‘Algebra der Logik,’ 3 vols., 1890-95) and of Prof. Gottlob Frege (see an account of his writings in the appendix to Mr Russell’s ‘Principles’). They belong largely to a department of philosophical thought which may be termed

“the Philosophy of the Exact Sciences.” This deals with two great questions—the logical foundations of scientific reasoning, and the general outcome and importance of scientific thought, not for technical purposes, but in the great edifice of human thought which we may term Philosophy. It deals with what has been called “the Creed of Science” and its value. Stanley Jevons and Prof. Karl Pearson in this country, Prof. Mach in Germany, and M. Poincaré in France, have treated the philosophy of science in one or both of these aspects.