

one that the deductions depend upon. To illustrate, one may prove the theorems of geometry relating to the circle by using wire circles just as well as by using a highly artificial definition of an abstract circle, provided that he does not depend upon the copper or silver, or their qualities, nor upon the thickness, or cross-section of the wire. In most work in mathematics we are engaged in finding the deductions that can be drawn from certain features only of a concrete existence and which are not in the least affected by other features of the object. In other words the most highly concrete object is just as good as the most highly abstract object for deductions that are limited to certain characters possessed in common by the two. From this point of view the definition from geometric objects is justifiable. On the other hand the recognition of the non-geometric character of all the numbers deduced is one that if more common would prevent much wasted ink and time. Such a notion as that of the product of two geometric vectors ought to disappear from the field, for instance, save as a phraseology perhaps. The fruitless discussions over the identification of the right quaternion and the vector (geometric) would no longer be heard of, and all vector systems would be recognized as algebras of hypernumbers.

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*Napier Tercentenary Memorial Volume.* Edited by CARGILL GILSTON KNOTT. London, Longmans, Green and Company, 1915. xi+441 pp. Price, £1 1s.

THIS sumptuous volume compiled by Dr. Knott is made up of the addresses and essays communicated to the International Congress held in Edinburgh in 1914 to commemorate the tercentenary of the publication of Napier's epoch-making *Mirifici Logarithmorum Canonis Descriptio*.

The papers are both historical and mathematical, the former dealing with the life and works of Napier and of his contemporaries, immediate predecessors, or followers, and the latter part of the work treating of the modern progress in calculation, in the preparation of tables, and the like. There is also an account of the Edinburgh meeting, with the addresses of a formal congratulatory nature, a list of members, and two indexes, one of subjects and the other of names.

The historical papers are as follows: "The invention of logarithms," by Lord Moulton, a careful study of the working