

to the questions he has set himself. He has recourse finally to the advice often given to the young aspirant toward mathematical research: Study the great masters! They had a certain flair for recognizing the valuable and important directions of advance. And the fact remains that, even though we cannot find any simple rules which govern the directions of progress, progress does exist. Our science has advanced and is continually advancing in spite of the lack of any conscious direction.

The author obviously laid down his pen after writing the last word of his interesting little book with a feeling of discouragement and dissatisfaction. The reader shares this feeling;—but, in spite of it, he feels that the writing and the reading has been worth while. The questions raised are of fundamental importance and of the greatest interest. The fact that they remain to a large extent unanswered is merely a challenge to the future. The reviewer has a feeling that the answer may possibly be found in a more vigorous attack on the question which the author himself raises but which he dismisses with a few words. Just what is implied by the words “beautiful,” “elegant,” “remarkable” as used by the mathematician? Just what is the “flair” which the great masters possess? Is it not possible that this flair is essentially artistic in its nature and that the development of mathematical science is governed largely by laws analogous to those that govern the development of the fine arts?

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## SHORTER NOTICES

*Ueber Spiralen.* By Archimedes. Translated and annotated by Arthur Czwalina-Allenstein. Leipzig, Akademische Verlagsgesellschaft, 1922. 71 pp.

This German translation of Archimedes's classic work on spirals (Ostwald's *Klassiker*, No. 201), which is now published on account of the fact that Nizze's German translation of 1824 has long been out of print, is of no significance for the American student, as we have Heath's admirable translation.\* The supplement (pp. 61–71) gives a reconstruction of a possible method by which Archimedes may have been led to his results; the method is ingenious and plausible, but it has the serious defect that it considers the ratio of an area to a volume, which would have been anathema to a Greek of the classical period; so that we can hardly be convinced, in the absence of evidence, that even so original a genius as Archimedes would have hit upon this particular method. It is probably as well to confess that we are entirely ignorant of the way in which Archimedes did arrive at his admirable results.

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\* *The Works of Archimedes*, edited in modern notation with introductory chapters by T. L. Heath. Cambridge, 1897.