Mathematical Association

Review

Author(s): W. B. Morton

Review by: W. B. Morton

Source: *The Mathematical Gazette*, Vol. 4, No. 62 (Mar., 1907), pp. 38-39

Published by: [Mathematical Association](#)

Stable URL: <http://www.jstor.org/stable/3603627>

Accessed: 19-10-2015 03:35 UTC

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <http://www.jstor.org/page/info/about/policies/terms.jsp>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.

Mathematical Association is collaborating with JSTOR to digitize, preserve and extend access to *The Mathematical Gazette*.

<http://www.jstor.org>

graph work, the change in a variable quantity can be so well shown. In the case of a chord moving towards the centre of a circle, the *fact* of change is obvious to a boy, the interest is in the *nature* and *rate* of the change, and it is at this, the most effective time, that the change in the sine, cosine, and tangent of an angle should be placed on record by a graph, and this put to practical use in the solution of a right-angled triangle. This, moreover, is possible without even the necessity of premature mention of these technical terms.

A preliminary course similar in extent and treatment to that roughly outlined above seems the most fitting introduction to the subject. If a boy worked through this—and any ordinary boy and girl easily can—and went no further, he would have done something worth doing in itself; if he proceeds further, it forms an admirable foundation to build upon, and rapid progress would be possible; indeed, when the chief points have been thus reconnoitred, the so-called ‘logical’ treatment is comparatively simple. Here, again, far more free class discussion is needed, if only for bringing out defects in reasoning which otherwise escape detection. Indeed, the much exaggerated sequence difficulty may prove an advantage, for how is one to really learn what reasoning in a circle means, if he is always to go along a path marked out for him by authority; or how learn the danger of false analogy as between plane and solid geometry for example—an error more common perhaps than is usually suspected; or the advantage or disadvantage of considering special cases? In short, one cannot learn to discuss without discussing, of which we have next to none in our school or university systems; he cannot learn to judge the value of evidence or proof if he is accustomed to one kind only, and that, one which excludes real cases, and keeps strictly to the hypothetical; nor can he learn to reason as a modern if his models and practice are just those of the ancients, Euclid, Aristotle or others. The fatal objection against the old system may still lie against the new if after some shuffling of propositions and shedding of extraneous matter we follow on much in the same track as before instead of proceeding along the lines so clearly marked out by scientific investigators.

J. G. HAMILTON.

REVIEW.

A System of Applied Optics. By H. DENNIS TAYLOR. (Macmillan.)

This is a book on optics by a practical optician. It is almost, if not quite, the first book of its kind written by an Englishman, and as such, as well as for its intrinsic merits, it deserves a warm welcome. In Germany the modern literature of optics is in closest alliance with the great optical industry of the country—an alliance of theory and

practice which explains the notable success of the latter. But in this country our optical books have been written with a view to mathematical examinations, and are beautifully remote from the pieces of glass which we use in our cameras and microscopes. The lenses, in fact, serve as an excuse for the mathematics. With regard to Mr. Taylor's book also we may say, in a different sense, that the lenses are an excuse for the mathematics. His formulae are at times terrific, and his analysis seems, to the merely academic mind, somewhat lacking in elegance, but these things do not count against the satisfaction the reader feels in the real connexion between the results obtained and the actual production of good lenses. Indeed, the author tells us how his theoretical investigations guided him towards the design of the well-known "Cooke" forms of lens-combinations.

In the preface reference is made to the important advances in optical theory due to Abbe and his school, and to Seidel, but the author does not adopt any of their methods. He bases his work on that of Coddington, whose formulae he extends, in the first instance, by analysis of wide instead of narrow pencils. At an early stage in the book the method of "elements" is introduced, and is a prominent feature of all that follows. This consists in the device of regarding a thick lens as made up of two thin lenses at the surfaces, each with a flat face on the inner side, and separated by a parallel plane glass plate. After preliminary sections on first order formulae and the equivalent focal lengths of systems of thin lenses, the corrections for width of pencil, obliquity, and eccentricity of incidence are discussed in succession. These corrections are finally embodied in two lengthy formulae, applying to the primary and secondary planes, and giving the points of convergence of extreme rays of a pencil falling obliquely on a lens through a stop of given aperture and position. The terms are clearly grouped according to their dependence on thickness, spherical aberration, normal curvature error, eccentricity correction associated with spherical aberration, and eccentricity correction associated with coma. In following sections we have an admirable discussion of the bearings of the analytical results on the actual problem of lens design, then a detailed account of coma, with reproduction of some of Prof. Thompson's interesting photographs; and finally, sections on distortion and achromatism. Through the whole book the author's practical acquaintance with the matters under discussion is constantly in evidence.

It is natural to compare the book under review with the recently published book, *Die Bilderzeugung in optischen Instrumenten*, produced in collaboration by the scientific workers of the firm of Zeiss in Jena. One misses the elegance of method and the generality of treatment which are such conspicuous features of the German book. But against these we must set the absolute straightforwardness of Mr. Taylor's mode of attack, the thoroughness of his discussion of the special formulae which he evolves, and the simplicity of his mathematical methods. By these qualities he will appeal to many readers who would fail to gather very definite ideas from the other book mentioned.

W. B. MORTON.