BOOK REVIEW

Reflecting Telescope Optics I*

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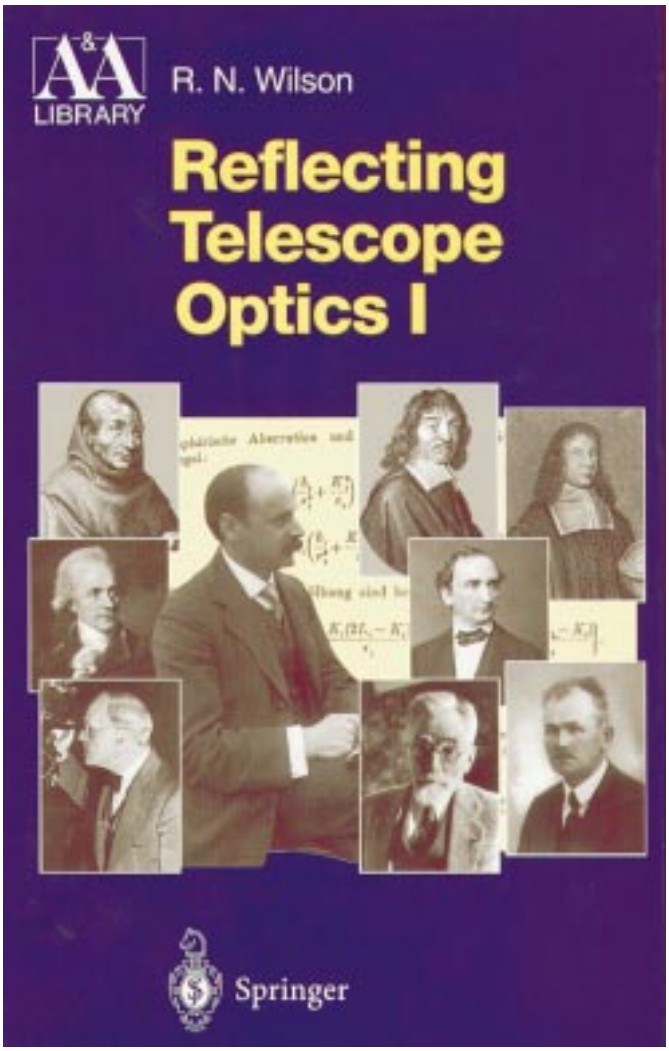
Since the mid-19th century and the application by Foucault of chemical silvering to glass mirrors, reflecting telescopes have gradually taken over from refracting ones, to eventually become the dominant telescope concept over the entire 20th century. Reflecting Telescope Optics I (RTO I) is an unequalled reference for those who have interest in the field, be they students, telescope designers, professional or amateur astronomers.

In Chapter 1 the author takes us on a short, fascinating and at times surprising, journey through the history of telescope design. A delightful story of men, ideas and fascinating machines. It stems from the account by the author that optics is one of those sciences whose progress is inescapably tied to the progress of experimentation and technology. Chapter I tells about great ideas which, sometimes, had to wait for centuries before being understood and recognised.

The second and third chapters deal with Gaussian optics and aberration theory, respectively. Fundamental aspects of Gaussian optics are reviewed in a concise manner, albeit to a level of detail sufficient to make the book a valuable reference for an advanced course on geometrical optics. The same comment applies to the third chapter, which deals with aberration theory of telescopes – in the broadest sense. All relations necessary to set up a design, understand and evaluate its first-order (paraxial) properties and third-order aberrations are clearly demonstrated and their implications thoroughly analysed. Section 2.2.5.2, in particular, will be invaluable to set up the basis for a two-mirror telescope design, while section 3.2.4 provides all necessary information to evaluate its aberrations. Tables and practical examples provide most useful illustrations to the theory, and serve as well for quick reference when reviewing properties of existing designs.

A thorough review of one- and two-mirror design solutions is provided in sections 3.2.6 and 3.2.7, together with detailed illustrations and numerical examples. Section 3.3 provides much detailed and useful information on third order aberrations.



A unique and most complete review of wide-field telescope designs, from Schmidt and Maksutov solutions to less known three- and four-mirror designs, is proposed in section 3.6; off-axis designs are addressed in section 3.7, together with a detailed analysis of the effects of decentring of 2-mirror telescopes. Even if this is certainly not its main purpose, there is little doubt that these sections will retain the attention of amateur telescope makers as well.

Elaborating on a generalisation of the Schwarzschild Theorem, the author demonstrates the relation between the number of optical surfaces and the achievable compensation of third-order aberrations. The four-mirror designs with spherical primary and secondary mirrors derived in section 3.6.5.3 pave the way for giant telescopes beyond the 10-m range.

Despace effects are reviewed in much detail (section 3.8), unfortunately in the restricted case of two-mirror designs only. As such effects can be of utmost importance with regard to preservation of optical quality and may come to play a role in a trade-off between otherwise equivalent designs, it seems to me that a broader – and, in view of its tremendous complexity, simplified – account would have usefully complemented the review of three- and four-mirror designs of section 3.6.

A brief but quite complete account of diffraction theory and its relation to aberrations is provided in section 3.10. This section is essential to the completeness of RTO I; it provides the key to understanding image formation and properties, and appeals to the broadest range of readers.

Chapter 4 covers field correctors and focal extenders/reducers in great detail, and provides a brief account of atmospheric dispersion correctors, thereby adding to the completeness of RTO I.

Finally, theory meets reality in chapter 5, which provides a delectable and most instructive account of major telescope projects – and ideas related to them – from the early 19th century until the mid-1980's.

It should be pointed out that, although RTO I deals with telescope optics in a largely theoretical manner, realistic constraints and limitations are given due regard, a consequence of the author's impressive experience in telescope design and fabrication.

This review would be incomplete if no acknowledgement were made to the rigorous and consistent formalism of the author, as well as to the useful indices, list of symbols, tables and figures, the most complete bibliography, and the unique portrait gallery of major figures in the field.

Indeed, a unique reference in a superb presentation.

* Reflecting Telescope Optics I is the first in a series of two volumes by Raymond N. Wilson, formerly Senior Optical Engineer at ESO. Amongst other major achievements, Ray Wilson developed at ESO the concept of Active Optics, applied to the 3.5-m NTT and 8-m VLT telescopes.