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Walking with Christiaan Huygens, by Tijmen Jan Moser and Enders Anthony Robinson, ISBN 978-3-031-46157-6, 2024, Springer, 315 p., US$159.99 (print), $119 (e-book).

According to Huygens' principle, all points on a wavefront act as secondary sources emitting spherical waves, and the envelope of these spherical waves forms a new wavefront. As exploration geophysicists, we are all familiar with this principle. It lies at the basis of reflection, refraction, and diffraction, and it plays a pivotal role in seismic imaging: the migration impulse response is a spherical reflector (when the propagation velocity is constant) and the actual reflectors are formed by the envelopes of many of these spherical reflectors. Huygens' principle is a milestone in the history of wave theory. Yet it is only one of Huygens' many impressive contributions to early modern science.

With their book *Walking with Christiaan Huygens*, Moser and Robinson pay tribute to the rich scientific work of this Dutch mathematician, physicist, and astronomer, who lived from 1629 to 1695. They show that, although his contributions are often undervalued compared to those of his contemporaries such as Isaac Newton, he played an important role in bridging ancient and modern science. The authors are to be commended for painstakingly delving through the original writings of Huygens, including his scientific correspondence with contemporaries. The integration of these rich sources of information with their own insights into Huygens' work resulted in this erudite, yet highly readable account on Huygens' role in the development of modern science.

Huygens' most famous invention is the pendulum clock. In the 17th century there was a great need for accurate timekeeping to determine longitude for navigation at sea. At the time, existing clocks were accurate to about 15 minutes a day, which was insufficient for this purpose. Huygens' pendulum clock was accurate to 10 seconds a day! Pendulum clocks remained the most accurate clocks for the following 300 years. Not easily satisfied, Huygens theorized further about pendulums. Knowing that the period of a pendulum is only constant for small angles of swing, he used his mathematical ingenuity to deduce that the pendulum would have to swing along a cycloidal path (rather than a circular path) to have a period independent of the angle of swing.

Huygens was a great astronomer and contributed to the development of the telescope. In particular, he improved the eyepiece (the ocular lens) to have a wider field of view and to suppress chromatic aberration. His improved telescope (developed together with his brother Constantijn) contributed largely to more accurate astronomical observations. His most famous astronomical discoveries are Saturn's moon Titan and the explanation that the curious extension of Saturn, observed by Galilei in 1610, is in fact a ring around Saturn.

Moser and Robinson explain these scientific highlights and many more with enthusiasm, great clarity, much historical context, and many illustrations (sometimes copied from the original publications). They often come with detailed mathematical explanations that, for example in the case of the cycloidal pendulum, stimulate the reader to think deeply to understand all the details. This book is an important source of information for anyone interested in the history of physics. For exploration geophysicists the chapters on wave theory are probably of most interest. After the introduction of Huygens' principle in chapter 4, using the geometrical explanations of the time, chapter 7 describes the further developments by Fresnel, Green, Kirchhoff, and Helmholtz, culminating in the well-known Kirchhoff-Helmholtz integral of the 19th century. Chapter 11 continues with the development of diffraction theory into the 20th century. Finally, chapter 12 discusses the significance of Huygens' principle in seismic imaging, including an interesting illustration from 1921 by J. C. Karcher, showing an image of the Viola limestone, formed by the envelope of circular arcs.

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