Christiaan Huygens
1629-1695

Huygens was born on 14 April 1629, the second son of Constantijn Huygens (1596-1687) and Suzanna van Baerle. His grandfather (Christiaan) and father were secretaries to stadholders of the House of Orange, and Christiaan grew up in a very wealthy and highly cultured milieu. He was educated at home, by private tutors as well as his father, until sixteen. In 1645 Huygens went to study Law and mathematics at Leiden, the latter under Frans van Schooten, Jr., and two years later he transferred to the Illustrious School in Breda, where besides studying Law he may have profited from John Pell, who taught mathematics there. At home, Huygens met René Descartes, and his father introduced him into the correspondence circle of Marin Mersenne. Huygens obtained a degree at the University of Angers in 1655.

Because of the family's wealth, Huygens was free to pursue his studies without having to earn a living. During the late 1640s and 1650s, Huygens completed works on hydrostatics, mathematics (in which he published *De circuli magnitudine inventa* in 1654 and *Tractatus de ratiociniis in alae ludo* in 1657), and geometrical optics. In 1654 he and his brother Constantijn began making telescopes, and with one of their first products Huygens discovered a moon of Saturn (now named Titan) in 1655. He went on to solve the problem of Saturn's appearances by supposing that the planet was surrounded by a ring, and in 1657 published his *Horologium*, in which he described the application of the pendulum to clocks.

By the time he published *Systema Saturnium* in 1659, at the age of 30, Huygens was one of the foremost scientists in Europe and corresponded with scientists all over Europe. In his twenties and early thirties, Huygens made several trips to France and England and made important personal and scientific contacts in those countries. He became a regular correspondent and foreign member of the Royal Society of London, and when the Académie Royale des Sciences was founded in 1666, Huygens became its most prominent member. He lived in Paris from 1666 to 1681, with two interruptions (1670-1671 and 1675-1676), when he lived in The Hague, recovering from illnesses. When illness took him to The Hague again, in 1681, he decided not to return because the climate for Protestants was becoming increasingly hostile in France. He spent the rest of his life

at the family house in the center of The Hague and at the country house 'Hofwijck' in nearby Voorburg.

In his mathematical work on the pendulum, Huygens discovered that while a simple pendulum is not isochronous, if the bob can be made to describe a cycloid the pendulum will be isochronous. Through his invention of the theory of evolutes, he could show that the curvature of the 'cheeks' that changed the path of the pendulum had to be cycloidal as well. Huygens went on to build an entire mathematical physics of the pendulum, which he published in 1673 under the title *Horologium oscillatorium*. The work contained the formula (but not the derivation) for acceleration in a circle, a crucial relationship for tying together celestial and terrestrial physics.

Huygens and his brother Constantijn made a large number of lenses. Upon the publication of *Systema Saturnium*, Huygens's telescopes were considered by many the best in Europe, and he was attacked by the Roman telescope maker Eustachio Divini. Their battle was never settled by means of direct comparison, but eventually Huygens had to acknowledge that the telescopes of Giuseppe Campani of Rome were superior to his. In the early 1660s, however, he discovered a combination of field lens and ocular that resulted in a compound eyepiece that partially suppressed optical defects, the 'Huygens Eyepiece'. During his stay in Paris, Huygens did not grind lenses, but upon his return to The Hague, in 1681, he and Constantijn ground a large number of long-focus lenses, a number of which survive. Throughout this period, Huygens worked on the geometrical analysis of lenses and lens-systems, work that was not published until after his death.

Huygens was a Cartesian and a mathematical physicist. Early in his career he corrected Descartes's faulty laws of impact and four decades later, in response to Isaac Newton's optical papers and his *Principia*, he published *Traité de la lumière* (1690), in which he gave a wave construction that could explain the rectilinear propagation of light and the double refraction of Island spar (calcite) and added a treatise on the cause of weight in which he returned to his Cartesian roots, invoking multilateral vortices to explain gravity. Finally, near the end of his life he wrote a popular cosmological treatise, *Kosmotheoros*, in which the new discoveries of the seventeenth century and the new dimensions of the solar system were set out in an engaging fashion. The book was extremely popular and was translated into English and French. He had just finished this book when he died, on 8 July 1695.

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