

Second edition of Boyle's *New Experiments* where he announces his law of gases, stating that the volume occupied by a gas (such as air) in a confined space is reciprocal to its pressure.

Boyle, Robert. *New Experiments: Physico-Mechanical, Touching the Spring of the Air, and Its Effects, Made, for the most part, in a New Pneumatical Engine*. Oxford: Printed by H. Hall, printer to the University, for Tho: Robinson. 1662. London: Thomas Robinson, 1662. 7 7/8 inches (200 mm), [17], 207 pp.

The sting is in the tail (or the appendix) of this second edition of *New Experiments Physico-Mechanical, touching the Spring of the Air, and its Effects*. Published two years after the first edition, it reprints the original text on pneumatics, and adds as an appendix two new tracts, in the first of which Boyle announces his law of gases, stating that the volume occupied by a gas (such as air) in a confined space is reciprocal to its pressure. Boyle was an enthusiastic experimenter, fascinated by the vacuum and the air-pump. He tested his hypotheses by experiment, a (or rather *the*) scientific method now conventional but not invariably practiced in earlier times.

The air-pump had been invented in Germany by Otto van Guericke in 1654: Boyle heard of it three years later. Boyle's laboratory assistant, the young Robert Hooke (1635–1703) constructed the first English air-pump, enabling them to make exhaustive researches into the physics of the atmosphere. **Spread 13** depicts Hooke's air-pump or "Pneumatical Engine," by means of which Boyle was able to demonstrate that air has weight, and that sound depends on air for its transmission. Respiration and combustion (life and flame) also required air; he showed, on the other hand, that light and magnetism were unaffected by a vacuum.

Robert Boyle (1627–1691) was not only the most eminent British scientist of his day: he was the son of the Earl of Cork and related to most of the Anglo-Irish aristocracy. *New Experiments* (**Spreads 4–115**), his first publication, took the form of a letter to his nephew, the Viscount of Dungarvan, a sympathetic audience. (**Spreads 9–11** form a useful guide to the nature of the 43 experiments there described.) Less well-disposed were two English scholars, the philosopher Thomas Hobbes and the Jesuit Francis Linus,

who tried to defend the old Scholastic belief that a vacuum could not exist. The two additional essays in this edition attempt to refute the philosopher's *Dialogus Physicus* (1661) in *An Examen of Mr. T. Hobbes ...* (**Spreads 184-239**) and the Jesuit's *Tractatus de Corporum Inseparabilitate* (1661) in *A Defence ... against the Objections of Franciscus Linus* (**Spreads 116-83**). It was in this essay that the "Hypothesis" (as Boyle called it) on gases first appeared—see Chapter V on **Spreads 150-56**—buttressed by much experimental evidence from both Hooke and Boyle on compression and rarefaction. The original edition of the book had remarked on the elasticity of air—the "Spring" of the title. In this second edition Boyle's Law quantified this elasticity by establishing a relationship between volume and pressure. In Boyle's words (**Spread 152, left side**): "the *Hypothesis* ... supposes the pressures and expansions to be in reciprocal proportion."

The book-label of the "Tixall Library" may be seen on **Spread 2**. That collection was originally formed by the recusant Sir Walter Aston, First Lord Aston (1584-1639) of Tixall, Staffordshire, friend and patron of the poet Michael Drayton and British Ambassador to Spain under James I and Charles I. By the nineteenth century the library had descended to the Constable family. It was finally sold at Sotheby's in London on 6th November 1899, as the late property of Sir F.A.J.C. Constable of Burton Constable and Aston Hall, in Yorkshire. A collection of books by Boyle formed lot 92, bought by Pickering and Chatto for £1 2s.