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(*b.* Ornans, France, 19 August 1584; *d.* Ornans, 14 September 1638), [military engineering](#), *scientific instrumentation*.

From his father, Jean, who was castellan of the château of Ornans, a lawyer by training, and probably an engineer, Vernier inherited an interest in all sorts of measuring instruments work. After becoming adept at using them, Vernier worked as a military engineer for the Spanish Hapsburgs, then rulers of Franche-Comté. His reading of the works of Nuñez Salaciense (Nonius), Clavius, and [Tycho Brahe](#), combined with his experience in helping his father survey and prepare an excellent map of Franche-Comté, led him to seek a new way to read off angles on surveying instruments.

Around 1540 Nuñez, a Portuguese mathematician who was trying to improve the accuracy of the astrolabe, a sixteenth-century preoccupation, hit upon the idea of engraving on the face of the astrolabe a series of scales laid out along concentric circles. The scale on any circle was determined by dividing the circumference of the circle into an equal number of parts, one less than that dividing the next circle out and one greater than that dividing the next circle in. Thus in shooting a star, the line of sight would inevitably fall very close to a whole division on one of the scales. By an elementary calculation or by use of a table, one could easily determine the number of degrees, minutes, and seconds of an angle being measured. In theory Nuñez' method could bring great accuracy, but it was extremely difficult to engrave with precision a different scale on each concentric circle. Brahe remarked that in practice Nuñez' method failed to live up to its promise (*Astronomiae instauratae mechanica* [Nuremberg, 1611], p. 2).

About fifty years later Clavius, who had studied under Nuñez, found a way to facilitate the engraving of the various scales on the concentric circular segments. His associate Jacobus Curtius further simplified Nuñez' method by placing the same scale on the concentric segments in such a way that the zero of the scale on any segment started one degree away from that of the scale on the preceding segment. It thus became possible to read off degrees and minutes directly if the outer scale were divided into degrees and if there were sixty concentric circular segments. These methods were described by Clavius in his *Geometria practica* (Rome, 1604), which Vernier surely read and meditated on.

Vernier replaced the fifty-nine inner concentric circular segments with a mobile concentric segment, thereby giving a mobile scale rather than a series of static ones. Thus he solved the difficulty of engraving many different concentric scales. By this time (1630) he had acquired a reputation as an excellent engineer and was *conseiller et général* des monnaies for the count of Burgundy. He made a special trip to Brussels to present his invention to Isabelle-Claire-Eugénie, the infanta of Spain, the ruler of Franche-Comté, who had him publish a description of it. Throughout the seventeenth century this work remained on the whole unknown to the European scientific community. Certainly the declining importance of the Spanish Hapsburgs within [Western Europe](#) did not facilitate diffusion of Vernier's treatise nor did the development of technology favor the vernier because the extra precision it brought could not make seventeenth-century instruments more accurate than was allowed by open sights, which were commonly used, and by the imprecise methods of marking scales. Indeed, at the start of the eighteenth century, as soon as the technological situation became propitious, the vernier began to be used; but Vernier's name did not become associated with his invention until around the middle of the century.

After publishing his treatise in 1631, Vernier returned to Dôle, where he designed and directed the construction of fortifications. His other engineering projects included the design of a building for the arquebusiers of Dôle. In 1636 illness forced him to discontinue the practice of engineering; and he returned to Ornans, where he died a few years later.

BIBLIOGRAPHY

I. Original Works. Vernier's writings are *La construction, l'usage, et les propriétés du quadrant nouveau de mathématique: Comme aussi la construction de la table des sinus ...* (Brussels, 1631); "Traité d'artillerie" (MS at the Bibliothèque Nationale, Paris, according to Michel, p. 349); a map prepared by Vernier's father with the aid of Vernier is described in Claude François Rolland, "Études sur la cartographie ancienne de la Franche-Comté ..," in *Mémoires de la Société d'émulation du Doubs*, 8th ser., **7** (1912), 187–299; and **8** (1913), 375–429 (see 404–421); the plan of a mill that Feuvrier attributes to Vernier in his study on him (see below) figures in J. Feuvrier, "Les derniers mouline à bras et à chevaux en Franche-Comté," in *Procès-verbaux et mémoires de l'Académie des sciences, belles-lettres et arts de Besançon* (1912), 125–131; that of the building for the arquebusiers that he also attributes to Vernier is in J. Feuvrier, "Les chevaliers du noble et hardy jeu de l'arquebuse de la ville de Dôle," in *Mémoires de la Société d'émulation du Jura*, 6th ser., **2** (1897), 1–70, plan on plate between 24–25, discussion on 27–28.

II. Secondary Literature. The Archives Départementales du Doubs confirmed the correctness of Vernier's dates of birth and death. Henri Michel, "Le 'vernier' et son inventeur Pierre Verinier d'Ornans," in *Mémoires de la Société d'émulation de Doubs*, 8th ser., **8** (1913), 310–373, gives a comprehensive history of the vernier and the salient features of Vernier's life; Julien Feuvrier, "L'ingénieur Pierre Vernier à Dôle," in *Procès-verbaux et mémoires de l'Académie des sciences, belles-lettres et arts de Besançon* (1912), 293–302, which contains a facsimile of a handwritten report by Vernier, adds to Michel details concerning Vernier's family and his activity as an engineer der Transversalteilungen und des 'Nonius,'" in *Zeitschrift für Vermessungswesen*, **39** (1910), 177–191, 209–223, 241–254, gives details of the background to the vernier; A. Breusing, "Nonius oder Vernier?" in *Astronomische Nachrichten*, **96** (1879), 131–134, is superseded by the above studies; Maurice Daumas, *Les instruments scientifiques aux XVLL^e et XVLLL^e siècles* (Paris, 1953), 250–255, briefly discussed the history of the vernier; and J. B. J. Delambre, *Histoire de l'astronomie moderne*. **II** (Paris, 1821), 119–125, gives extensive extracts from Vernier's treatise on the vernier.

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