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(*b*. Kieslingwalde, near Görlitz, Germany, 10 April 1651; *d*. Dresden, Germany, 11 October 1708)

mathematics, physics, philosophy.

Tschirnhaus was the youngest son of Christoph von Tschirnhaus, a landowner, and Elisabeth Eleonore Freiin Achyll von Stirling, who belonged to a collateral branch of the mathematically gifted Stirling family. His mother died when he was six, but he was brought up by a loving stepmother. After receiveing an excellent education from private tutors, Tschirnhaus entered the senior class of the Görlitz Gymnasium in 1666. In the autumn of 1668 he enrolled at the University of Leiden to study philosophy, mathematics, and medicine. He was deeply impressed by the tolerant atmosphere there, as well as by the fiery philosopher Arnold Geulincx, an occasionalist, and the distinguished physician F. de la Boë (Sylvius), who taught Harvey's theory of the circulation of the blood. The most profound influence on him in these years, however, was that of Descartes's philosophy and mathematics, to which he was introduced in private instruction by pieter van Schooten.

At the beginning of the war between Holland and France in 1672, Tschirnhaus joined the student volunteer corps but did not see action. Following a short visit to kieslingwalde in 1674, he returned to Leiden and was introduced by his school friend Pieter van Gent to Spinoza, whose teachings he immediately adopted. With a letter of recommendation from Spinoza, he went to London in May 1675 to see Henry Oldenburg. Tschirnhaus had become an excellent algebraist and was able to make a persuasive presentation of his methods for solving equations. He visited John Wallis at Oxford and held discussions with John Collins, to whom he showed examples of his methods. On closer examination, however, they proved to be special cases of a previously known solution.

Bearing recommendations from Oldenburg addressed to Huygens and Leibniz, Tschirnhaus moved to Paris in the fall of 1675. He did not then know French, and when engaged to teach mathematics to one of Colbert's sons, did so in Latin. In an animated exchange with Leibniz, Tschirnhaus reported in general terms on his own methods but only half listened to what Leibniz told him concerning his recent creation of a symbolism for infinitesimal processes. In fact, Tschirnhaus never did grasp the significance of Leibniz' disclosure, and throughout his life he considered the infinitesimal symbolism to be of limited applicability.

Leibniz introduced Tschirnhaus to Clerselier, who had custody of Descartes's papers and allowed them to look through unpublished manuscripts. The two also had an opportunity to examine the posthumous papers of Pascal and Roberval. Tschirnhaus reported on the progress of his studies at Paris in a number of interesting letters to Pieter van Gent, Spinoza, and the latter's friend G. H. Schuller. In the summer of 1676 he corresponded with Oldenburg concerning Descartes's mathematical methods. Tschirnhaus considered them unsurpassable, but Collins had expressed considerable skepticism about them. Consequently, the reports in which Oldenburg and Newton communicated the results obtained by expansions of series were addressed jointly to Leibniz and Tschirnhaus. In his reply of 1 September, Tschirnhaus judged these results somewhat disparagingly; Collins responded with a strong rebuttal, as did Newton in a second letter to Leibniz and Tschirnhaus (3 November 1676).

Also in 1676 Tschirnhaus accompanied Count Nimpsch of Silesia on a trip to southern France and Italy. Everywhere he went, Tschirnhaus sought contact with leading scientists, collected observations, and reported interesting discoveries to Leibniz. Among the matters he communicated to Leibniz was an algorithmic method of reduction that he wrongly believed could be applied to equations of any higher degree. (This method was published in *Acta eruditorum* in 1683.) He also reported on a supposedly new method of quadrature that was in fact merely the result of recasting a procedure devised by Gregory of Saint-Vincent in 1647 in a form better suited for computation. (The improvement had been effected by the use of indivisibles of zero width.) During his return trip in 1679, Tschirnhaus stopped at Paris, at The Hague (where he saw Huygens), and at Hannover (where he visited Leibniz).

While continuing his mathematical research Tschirnhaus constructed effective circular and parabolic mirrors, with which he obtained high temperatures by focusing sunlight. He also made burning glasses, though not without flaws. During a trip to Paris in the summer of 1682, he became a member of the Académie des Sciences. He did not, however, receive the hoped-for royal pension that would have enabled him to pursue his scientific work free from financial concern. After returning from Paris, Tschirnhaus married Elisabeth Eleonore von Lest, who took over most of the details of managing the estate his father had left him, thus permitting him to devote his time entirely to study. Among his achievements was the rediscovery of the

process for making hard-paste porcelain. J. F. Böttger, who is usually given the credit, was a skilled craftsman, but all his work was done under Tschirnhaus' supervision.

Tschirnhaus exhausted his mathematical talents in searching for algorithms. Lacking insight into the more profound relations among mathematical propositions, he was all too ready to assert the existence of general relationships on the basis of particular results that he obtained. Further, he was unwilling to accept suggestions directly from other mathematicians, although he would later adopt them as his own inventions and publish them as such. This tactic led to bitter controversies with Leibniz, Huygens, La Hire, and Jakob I and Johann I Bernoulli; and it ultimately cost him his scientific reputation. Without going into details, we may mention two of these disputes. The first, with Leibniz, concerned the possibility of algebraic quadratures of algebraic curves (1682–1684). The second, with Fatio de Duillier (1687–1689), was provoked by Tschirnhaus' publication of an incorrect method of finding tangents to curves generated by the motion of a drawing pencil within a system of taut threads. The method appeared in a major work of considerable philosophical importance, *Medicina corporis et mentis* (1686–1687), which was influential in the early stages of the Enlightenment. Another work by Tschirnhaus, *Gründliche Anleitung zu den nützlichen Wissenschaften* (1700), was highly praised by Leibniz in 1701. Both books deeply impressed Leibniz' disciple Christian Wolff.

Tschirnhaus was essentially an autodidact. During his university years he lacked the guidance of a kind, experienced, yet strict teacher, who could have restrained his exuberant temperament, moderated his excessive enthusiasm for Descartes's ideas, and instilled in him a greater measure of selfcriticism. Even so, Tschirnhaus' achievements–often accomplished with insufficient means–were far more significant than the average contribution made by university teachers of science during his lifetime. Indeed, even his errors proved to be important and fruitful stimuli for other scientists.

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J. E. Hofmann