

Desargues, Girard | Encyclopedia.com

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(b. Lyons, France, 21 February 1591; d. France, October 1661)

geometry, perspective.

One of the nine children of Girard Desargues, collector of the tithes on ecclesiastical revenues in the diocese of Lyons, and of Jeanne Croppet, Desargues seems to have studied at Lyons, where the family lived. The first evidence of his scientific activity places him in Paris on 9 September 1626, when, with another Lyonnais, François Villette, he proposed to the municipality that it construct powerful machines to raise the water of the Seine, in order to be able to distribute it in the city. Adrien Baillet, the biographer of Descartes, declares that Desargues participated as an engineer at the siege of [La Rochelle](#) in 1628 and that he there made the acquaintance of Descartes, but there is no evidence to confirm this assertion. According to the engraver [Abraham Bosse](#) (1602–1676), a fervent disciple of Desargues, the latter obtained a royal license for the publication of several writings in 1630. It was about this time that Desargues, living in Paris, seems to have become friendly with several of the leading mathematicians there: Mersenne, Gassendi, Mydorge, and perhaps Roberval. Although it is not certain that he attended the meetings at Théophraste Renaudot's Bureau d'Adresses (commencing in 1629), Mersenne cites him, in 1635, as one of those who regularly attended the meetings of his Académie Parisienne, in which, besides Mersenne, the following participated more or less regularly: Étienne Pascal, Mydorge, Claude Hardy, Roberval, and soon Carcavi and the young [Blaise Pascal](#).

In 1636 Desargues published two works: "Une méthode aisée pour apprendre et enseigner à lire et écrire la musique," included in Mersenne's *Harmonie universelle* (I, bk. 6), and a twelve-page booklet with one double plate that was devoted to the presentation of his "universal method" of perspective. The latter publication bore a signature that reappeared on several of Desargues's important works: S.G.D.L. (Sieur Girard Desargues Lyonnais).

Moreover, after presenting his rules of practical perspective, Desargues gave some indication of the vast program he had set for himself, a program dominated by two basic themes: on the one hand, the concern to rationalize, to coordinate, and to unify the diverse graphical techniques by his "universal methods" and, on the other, the desire to integrate the projective methods into the body of mathematics by means of a purely geometric study of perspective, several elements of which are presented in an appendix. This publication appears not to have excited a great deal of immediate interest among artists and draftsmen, who were hardly anxious to change their technique; in contrast, Descartes and Fermat, to whom Mersenne had communicated it, were able to discern Desargues's ability.

The publication in 1636 of Jean de Beaugrand's *Geostatique*, then of Descartes's *Discours de la méthode* in May 1637, gave rise to ardent discussions among the principal French thinkers on the various problems mentioned in the two books: the definition of the center of gravity, the theory of optics, the problem of tangents, the principles of [analytic geometry](#), and so on. Desargues participated very actively in these discussions. Although he made Beaugrand his implacable enemy, his sense of moderation, his concern to eliminate all misunderstandings, and his desire to comprehend problems in their most universal aspect won him the esteem and the respect of Descartes and Mersenne, as well as of Fermat, Roberval, and Étienne Pascal. His letter to Mersenne of 4 April 1638, concerning the discussion of the problem of tangents, illustrates the depth of the insights with which he approached such questions and, at the same time, his inclination to synthesis and the universal. Even though Descartes had prepared for him an introduction to his *Géométrie*, designed to "facilitate his understanding" of it, Desargues did not follow Descartes in his parallel attempts to algebraize geometry and to create a new system of explaining all the phenomena of the universe.

Desargues's goal was at once to breathe new life into geometry, to rationalize the various graphical techniques, and, through mechanics, to extend this renewal to several areas of technique. His profound intuition of spatial geometry led him to prefer a thorough renewal of the methods of geometry rather than the Cartesian algebraization; from this preference there resulted a broad extension of the possibilities of geometry. The *Brouillon project* on conics, of which he published fifty copies in 1639, is a daring projective presentation of the theory of conic sections; although considered at first in three-dimensional space, as plane sections of a cone of revolution, these curves are in fact studied as plane perspective figures by means of involution, a transformation that holds a place of distinction in the series of demonstrations. But the use of an original vocabulary and the refusal to resort to Cartesian symbolism make the reading of this essay rather difficult and partially explain its meager success.

Although he praised the unitary conception that inspired Desargues, Descartes doubted that the use of geometry alone could yield results as good as those that a recourse to algebra would provide. As for Fermat, he reserved his judgment, and the only geometer who really comprehended the originality and breadth of Desargues's views was the young [Blaise Pascal](#), who in 1640 published the brief *Essay pour les coniques*, inspired directly by the *Brouillon project*. But since the great *Traité des*

coniques that Pascal later wrote has been lost, Desargues's example survived only in certain of the youthful works of Philippe de La Hire and perhaps in a few essays of the young Newton. The rapid success of the Cartesian method of applying algebra to geometry was certainly one of the basic reasons for the poor diffusion of Desargues's ideas. In any case the principles of projective geometry included in the *Brouillon project* were virtually forgotten until the publication in 1820 of the *Traité des propriétés projectives* of J. V. Poncelet—who, moreover, rendered a stirring homage to his precursor, although he knew his work only from a few brief mentions.

In July 1639 Beaugrand criticized Desargues's work, asserting that certain of his demonstrations can be drawn much more directly from Apollonius. Irritated that Desargues, in an appendix to his study of conic sections, had discussed the principles of mechanics and had criticized Beaugrand's conception of geostatics, Beaugrand wrote in July 1640, a few months before his death, another violent pamphlet against the *Brouillon project*.

In August 1640, Desargues published, again under the general title *Brouillon project*, an essay on techniques of stonecutting and on gnomonics. While refining certain points of his method of perspective presented in 1636, he gives an example of a new graphical method whose use he recommends in stonecutting and furnishes several principles that will simplify construction of sundials. He cites the names of a few artists and artisans who have already adopted the graphical methods he advocates: in particular the painter [Laurent de La Hire](#) and the engraver [Abraham Bosse](#). In attempting thus to improve the graphical procedures employed by many technicians, Desargues was in fact attacking an area of activity governed by the laws of the trade guilds; he also drew the open hostility of all those who were attached to the old methods and felt they were being injured by his preference for theory rather than practice.

At the end of 1640 Desargues published a brief commentary on the principles of gnomonics presented in his *Brouillon project*; this text is known only through several references, in particular the opinion of Descartes, who found it a "very beautiful invention and so much the more ingenious in that it is so simple." Since 1637 Descartes had conducted an indirect correspondence with Desargues that had been established through Mersenne, and the two men had exchanged ideas on a number of subjects; in this way Desargues took an active part in the discussions that preceded the definite statement and the publication of Descartes's *Méditations*.

At the beginning of 1641 Desargues had Mersenne propose to his mathematical correspondents that they determine circular sections on cones having a conic for a base and any vertex. He himself had a general solution obtained solely by the methods of pure geometry, a solution that is known to us through Mersenne's comments (in *Universae geometriae mixtaeque mathematicae synopsis* [Paris, 1644], the preface to Mydorge's *Coniques*, pp. 330–331). Roberval, Descartes, and Pascal were interested in the problem, which Desargues generalized in his investigation of the plane sections of cones satisfying the above conditions. References in publications of the period seem to indicate that around 1641 Desargues published a second essay on conic sections, cited sometimes under the title of *Leçons de ténèbres*. But since no copy of this work has been found, one may suppose that there may be some confusion here with another work, either the *Brouillon project* of 1639 or with a preliminary edition of certain manuscripts on perspective that were later included in Bosse's *Manière universelle de M^r Desargues pour pratiquer la perspective...* (Paris, 1648). Yet a work that appeared later, Grégoire Huret's *Optique de portraiture et de peinture...* (Paris, 1670), specifies (pp. 157–158) that the *Leçons de ténèbres* is based on the principle of perspective that inasmuch as the sections of a cone with a circular base and any vertex are, for all cones, circles for two specific orientations of the cutting plane, therefore in general the projective properties of the circle may be extended to various types of conics, considered as perspectives of circles. This systematic recourse to considerations of spatial geometry obviously does not permit the identification of this work with either the *Brouillon project* of 1639 or the geometric texts of 1648 (mentioned below). But, in the absence of the decisive proof that would be provided by the rediscovery of a copy of the *Leçons de ténèbres*, no definite conclusion can be reached.

Desargues strove to spread the use of his graphical methods among practitioners and succeeded in having them experiment with his stonecutting diagrams without encountering very strong resistance. At the beginning of 1642, however, the anonymous publication of the first volume of *La perspective pratique* (written by the Jesuit Jean Dubreuil) gave rise to bitter polemics. Finding that his own method of perspective was both copied and distorted in this book, Desargues had two placards posted in Paris in which he accused the author and the publishers of this treatise of plagiarism and obtuseness. The publishers asserted that they had drawn his so-called "universal" method from a work by Vaulezard (*Abrégé ou raccourcy de la perspective par l'imitation...* [Paris, 1631]) and from a manuscript treatise of Jacques Aleaume (1562–1627) that was to be brought out by E. Migon (*La perspective spéculative et pratique... de l'invention de feu Jacques Aleaume... mise au jour par Estienne Migon* [Paris, 1643]). Desargues having replied with a new attack, Tavernier and l'Anglois, Dubreuil's publishers, brought out in 1642 a collection of anonymous pamphlets against Desargues's various writings on perspective, stonecutting, and gnomonics, to which they added the *Lettre de M. de Beaugrand...* of August 1640, which was directed against his projective study of conics.

Desargues, greatly affected by these attacks, which concerned the body of his work and put his competence and his honesty in question, entrusted to his most fervent disciple, the engraver Abraham Bosse, the task of spreading his methods and of defending his work. In 1643 Bosse devoted two treatises to presenting Desargues's methods in stonecutting and in gnomonics: *La pratique du trait à preuves de M^r Desargues, Lyonnais, pour la coupe des pierres en l'architecture...* and *La manière universelle de M^r Desargues, Lyonnais, pour poser l'essieu et placer les heures et autres choses aux cadrans au soleil*. Preceded by an "Acknowledgment" in which Desargues states he has given Bosse the responsibility for the spread of his methods, these works are clearly addressed to a less informed audience than the brief essays that Desargues had published on

the same subjects. Their theoretical portion is greatly reduced and more elementary, and numerous examples of applications are handled in a very didactic and often prolix manner. Although only fifty copies of Desargues's essays had been printed, and had been distributed mainly in scientific circles, Bosse's writings were given large printings and were translated into several languages; consequently, they contributed to the diffusion of Desargues's graphical methods among practitioners.

In 1644, however, new attacks were launched against Desargues's work. They originated with a stonemason, J. Curabelle, who violently criticized his writings on stonecutting, perspective, and gnomonics, as well as the two treatises Bosse published in 1643, claiming to find nothing in them but mediocrity, errors, plagiarism, and information of no practical interest. A very harsh polemic began between the two men, and Desargues published the pamphlet *Récit au vray de ce qui a esté la cause de faire cet escrit*, which contains a number of previously unpublished details on his life and work. He also attempted to sue Curabelle, but the latter seems to have succeeded in evading this action.

Although Desargues apparently gave up publishing, Abraham Bosse wrote an important treatise on his master's method of perspective, commenting in detail on a great many examples of the graphical processes deriving from the "universal method" outlined in 1636. This *Manière universelle de M^r Desargues pour pratiquer la perspective par petit-pied, comme le géométral, ensemble les places et proportions des fortes et foibles touches, teintes ou couleurs* (Paris, 1648) was directly inspired by Desargues and contains, in addition to a reprint of the *Exemple de l'une des manières universelles...* of 1636, several elaborations designed "for theoreticians" and others that are purely geometrical. These elaborations, which include the statement and proof of the famous theorem on perspective triangles, should be considered (at least those relating to the theorem should be) as having been written by Desargues. Certain remarks seem to indicate that these theoretical developments may have been the subject of an earlier version published in 1643, under the title of *Livret de perspective*, but no definite proof has yet been established. In 1653 Bosse completed this work with an account of perspective on planes and on irregular surfaces, which included several applications to his favorite technique, copperplate engraving. Desargues's influence is again evident, at least in the first part of this work, but it is less direct than in the *Manière* of 1648.

Meanwhile, relations between the two men had become less close. While continuing his work as an engraver and an artist, Bosse, since 1648, had been teaching perspective according to Desargues's methods at the Académie Royale de Peinture et de Sculpture. He continued to teach there until 1661, when the Academy, following a long and violent polemic in which Desargues intervened personally in 1657, barred him from all his duties, thus implicitly condemning the use and diffusion of the methods of perspective to which it had accorded its patronage for thirteen years. But Bosse continued, through his writings, to conduct a passionate propaganda campaign for his methods.

As for Desargues, after 1644 evidence of his scientific and polemic activity becomes much rarer. Besides the "Acknowledgment" (dated 1 October 1647) and the geometric elaborations inserted in Bosse's 1648 treatise on perspective, Descartes's correspondence (letter to Mersenne of 31 January 1648) alludes to an experiment made by Desargues, toward the end of 1647, in the context of the debates and investigations then being conducted by the Paris physicists on the nature of the barometric space. It seems that while remaining in close contact with the Paris scientists, Desargues had commenced another aspect of his work, that of architect and practitioner. There was no better reply to give to his adversaries, who accused him of wanting to impose arbitrary work rules on disciplines that he understood only superficially and theoretically. Probably, as Baillet states, he had already been technical adviser and engineer in Richelieu's entourage, but he had not yet had any real contact with the graphical techniques he wished to reform. It seems that his new career as an architect, begun in Paris about 1645, was continued in Lyons, to which he returned around 1649–1650, then again in Paris, to which he returned in 1657. He remained there until 1661, the year of his death.

In Paris the authors of the period attribute to Desargues, besides a few houses and mansions, several staircases whose complex structure and spectacular character attest to the exactitude and efficacy of his graphical stonecutting procedures. It also seems that he collaborated, for the realization of certain effects of architectural perspective, with the famous painter [Philippe de Champaigne](#). In the region of Lyons, Desargues's architectural creations were likewise quite numerous; he participated in the planning of several private and public buildings and of rooms whose architecture was particularly delicate. Of Desargues's accomplishments as an engineer, which seem to have been many, only one is well known and is worth mentioning: a system for raising water that he installed near Paris, at the château of Beaulieu. This system, based on the use, until then unknown, of epicycloidal wheels, was described and drawn by Huygens in 1671 (*Oeuvres de Huygens*, VII, 112), by which time the château had become the property of [Charles Perrault](#). Philippe de La Hire, who had to repair this mechanism, wrote about it (see *Traité de mécanique* [Paris, 1695], pp. 10, 368–374).

To complete this description of Desargues's activity, it is necessary to mention the private instruction he gave at Paris in order to reveal his different graphical procedures. Even before 1640 he had several disciples at Paris, as well as at Lyons, where, Moreri states, he was "of great assistance to the workmen... to whom he communicated his diagrams and his knowledge, with no motive other than being useful" (*Le grand dictionnaire historique*, new ed., I [Paris, 1759], 297).

In 1660 Desargues was again active in the intellectual life of Paris, attending meetings at Montmor's Academy, such as one on 9 November 1660, at which Huygens heard him present a report on the problem of the existence of the geometric point and sharply discuss the matter with someone who contradicted him. This is the last trace of his activity; the reading of his will at Lyons on 8 October 1661 revealed only that he had died several days before, without stating the date or place of his death, concerning which no document has yet been found.

A geometer of profoundly original ideas, sustained at the same time by a sense of spatial reality, by a much more precise knowledge of the great classic works than he admitted, and by an exceptional familiarity with the whole range of contemporary techniques, Desargues, in his geometrical work, introduced the principal concepts of projective geometry: the consideration of points and straight lines to infinity, studies of poles and polars, the introduction of projective transformations, the general definition of focuses, the unitary study of conics, and so on. Unfortunately, his work, burdened by a too original vocabulary and the absence of symbolism, and known only in a very limited circle, did not receive the audience it deserved. The disappearance of the essential portion of the work of his chief disciple, Blaise Pascal, and the sudden vogue of [analytic geometry](#) and infinitesimal calculus prevented the seventeenth century from witnessing the revival of geometry for which Desargues had laid the foundations. His few known forays into other areas of mathematics and mechanics attest to a perfect mastery of all the problems then under discussion and make us regret the absence of any publication by him. In the field of graphical techniques his contribution is of major importance. Between Dürer and Monge he marks an essential stage in the rationalization of the ensemble of these techniques, as much by the improvements he made in the various procedures then in use as by his concern for unity, for theoretical rigor, and for universality. But in this vast area, too, his innovations were bitterly contested and often rejected with contempt, even though the goal of their author was to reduce the burden of the practitioners through a closer and more trusting collaboration with the theorists.

After the reception, often reserved and sometimes malicious, that it received in his time and the oblivion that it experienced subsequently, Desargues's work was rediscovered and fully appreciated by the geometers of the nineteenth century. Thus, like that of all precursors, his work revealed its fruitfulness much more by its remote extensions than by its immediate repercussions.

BIBLIOGRAPHY

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II. Secondary Literature. Desargues directly inspired three works by Abraham Bosse: *La manière universelle de M^T Desargues, Lyonnais, pour poser l'essieu et placer les heures et autres choses aux cadrans au soleil* (Paris, 1643), also trans. into English (London, 1659); *La pratique du trait à preuves de M^T Desargues, Lyonnais, pour la coupe des pierres en l'architecture* (Paris, 1643), also trans. into German (Nuremberg, 1699); and *Manière universelle de M^T Desargues pour pratiquer la perspective...*, 2 vols. (Paris, 1648–1653), also trans. into Dutch, 2 vols. (Amsterdam, 1664; 2nd ed., 1686).

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