La Hire, Philippe De | Encyclopedia.com

(*b*. Paris, France, 18 March 1640; *d*. Paris, 21 April 1718)

astronomy, mathematics, eodesy, physics.

La Hire was the eldest son of the painter Laurent de La Hire (or La Hyre) and Marguerite Cocquin. His father was a founder of and a professor at the Académie Royale de Peinture et de Sculpture and one of the first disciples of the geometer G. Desargues. Philippe de La Hire was educated among artists and technicians who were eager to learn more of the theoretical foundations of their trades. At a very early age he became interested in perspective, practical mechanics, drawing, and painting. Throughout his life La Hire preserved this unusual taste for the parallel study of art, science, and technology, which he undoubtedly derived from the profound influence of the conceptions of Desargues.

Following the death of his father, La Hire suffered, according to the testimony of Fontenelle, "very violent palpitations of the heart" and left for Italy in 1660, hoping that the trip would be as salutary for his health as for his art. During his four years'stay in Venice, he developed his artistic talent and also studied classical geometry, particularly the theory of the conics of Apollonius. For several years after his return to France, he was active primarily sa an artist, and he formed a friendship with Desargues's last disciple, Abraham Bosse. In order to solve, at the latter's request, a difficult problem of stonecutting, he developed, in 1672, a method of constructing conic sections, which revealed both his thorough knowledge of classical and modern geometry and his interest in practical questions.

His *Nouvelle méthode en géométrie pour les sections des superficies coniques, et cylindriques* (1673) is a comprehensive study of conic sections by means of the projective approach, based on a homology which permits the deduction of the conic section under examination from a particular cicle. This treatise was completed shortly afterward by a supplement entitled *Les ploaniconiques*, which presented this method in a more direct fashion. The *Nouvelle méthode* clearly displayed Desargues's influence, even though La Hire, in a note written in 1679 and attached to a manuscript copy of the *Brouillon project* on Desargues's conics, affirmed that he did not become aware of the latter's work until after the publication of his own. Yet what we know about La Hire's training seems to contradict this assertion. Further more, the resemblance of their projective descriptions is too obvious for La Hire's not to appear to have been an adaptation of Desargues's. Nevertheless, La Hire's presentation, which was in classical language and in terms of both space and the plane, was much simpler and clearer. Thus La Hire deserves to be considered, after Pascal, a direct disciple of Desargues in projective geometry.

In 1685 La Hire published, in Latin, a much more extensive general treatise on conic sections, *Sections conicae in novem libros distributatae*. It was also inspired, but much less obviously, by the projective point of view, because of the preliminary study of the properties of harmonic division. It is primarily through this treatise that certain of Desargues's projective ideas became known. Meanwhile, in 1679, in his *Nouveaux élémens des sections coniques, les lieu géométriques*, La Hire provided an exposition of the properties of conic sections. He began with their focal definitions and applied Cartesian analytic geometry to the study of equations and the solution of indeterminate problems; he also displayed the Cartesian method of solving several types of equations by intersections of curves. Although not a work of great originally, it summarized the progress achieved in analytic geometry during half a century and contributed some interesting ideas, among them the possible extension of space to more than three dimensions. His virtuosity in this area appears further in the memoirs that he devoted to the cycloid, epicycliod, conchoid, and quadratues. This ingenuity in employing Cartesian methods was certainly what accounts for his hostility toward infinitesimal calculus in the discussions of its value raised in the Academy of Sciences starting gin 1701. While he did not persist in ignoring the new methods, he nonetheless used them only with reservation. Having actively participated in the saving and partial publication of the mathematical manuscripts of Roberval and Frénicle de Bessy, La Hire was also interested in the theory of numbers, particularly magic squares.

Mathematics was only one aspect of La Hire's scientific activity, which soon included astronomy, physics, and applied mathematics. His nomiantion to the Academy of Sciences as *astronome pensionnaire* (26 January 1678) led him to undertake regular astronomical observations, a task which he pursued until two days before his death. In 1682 he moved into the Paris observatory where he was able to use rather highly developed equipment, in particular the large quadrant of a meridian circle that was installed in 1683. If the bulk of his observations have remained unpublished, at least he extracted from them numerous specific observation: conjunctions, eclipses, passages of comets, sunspots, etc. In 1687 and 1702, La Hire published astronomical tables containing his observations of the movements of the sun, the moon, and the planets; they were severely criticized by Delambre for their purely empirical inspiration. Furthermore, he studied instrumental technique and particular problems of observation and basic astronomy. As a result of his wide-ranging interests, he produced a body of work that was important and varied but that lacked great originality.

During these years La Hire also took part in many geodesic projects conducted by groups from the Paris observatory. From 1679 to 1682, sometimes coordinates of different points along the French coastlines in the hope of establishing a new map of France. In 1683 he began mapping the extension of the meridian of Paris toward the north. In 1684–1685 he directed the surveying operations designed to provide a [water supply](#) for the palace of Versailles. La Hire devoted several works to the methods and instruments of surveying, land measurement, and gnomonics. During his journeys, he made observations in the natural sciences, meteorology, and physics. In addition, he played an increasingly active role in the various regular observations pursued at the Paris observatory: terrestrial magnetism, pluviometry, and finally thermometry and barometry.

Appointed on 14 December 1682 to the chair of mathematics at the Collége Royal, which had been vacant since Roberval's death, La Hire gave courses in those branches of scienc and technology in which mathematics was becoming decisive—astronomy, mechanics, hydrostatics, dioptrics, and navigation. Although his lectures were not published, numerous memoirs presented to the Academy of Scineces preserve their outline. In the area of experimental science La Hire's efforts are attensted by the description of various experiments—falling bodies, done with Mariotte in 1638, magnetism, electrostatics, heat reflected by the moon, the effects of cold, the physical properties of water, and the transmission of sound. He also studied the barometer, thermometer, clinometer, clocks, wind instruments, electrostatic machines, and magnets.

La Hire's work extended to descriptive zoology, the study of respiration, and physiological optics. The latter attracted him both by its role in astronomical observation and by its relationship to artistic technique, especially to the art of painting which La Hire continued to practice at the same time that he sought to grasp its basic principles.

La Hire was appointed, on 7 January 1687, professor at the Académie Royale d'Architecturereplacing F. Blondel. The weekly lectures that he gave until the end of 1717 dealt with the theory of architecture and such associated techniques as stonecutting. In the *Procé-verbaux de l'Académie royale d'architecture* mthere are many references to La Hire. In this regard he again appeared as a disciple of desargues. Desargues's influence in confirmed by the manuscript of La Hire's course on "La pratique du trait dans la coupe des pierres pour en former des voútes," which displays a generous use of the new graphic methods introduced by Desargues.

The important *Traité de mécanique* that La Hire published in 1695 represents a synthesis of his diverse theoretical and practical preoccupations. Although passed over by the majority of the historians of mechanics, this work marks a significant step toward the elaboration of a modern manual of practical mechanics, suitable for engineers of various disciplines. Colbert in 1675 iof seeing the Academy produce an exact description of all the machines useful in the arts and trades. On the theoretical plane, La Hire's treatise was already out of date at the time of its appearance because it ignored Newton's laws of dynamics and the indispensable infinitesimal methods. On the other hand, while La Hire did not tackle the problem of energy, he furnished useful descriptions and put forth the suggestion (already made in his *Traite des épicycloides*… [1694]) following Desargues, of adopting an epicycloidal profile for gear wheels.

Associated with the leading scientists of the age, La Hire was, for nearly half a century, one of the principal animators of scientific life in France. Not satisfied with publishing a multitude of books and memoirs, he also edited various writings of Picard, Mariotte, Roberval, and Frénicle, as well as several ncient texts.

His family life was simple and cirumspect. From his marriage with Catherine Lesage (*d. ca*, 1681), he had three daughters and two sons, one of whom, Gabriel-Philippe, continued his father's work in various fields. From a second marriage, with Catherine Nouet, he had two daughters and two sons;one of the latter, Jean-Nicolas, a physician and botanist, was elected an associate member of the Academy of Sciences.

It is difficult to make an overall judgment on a body of work as varied as La Hire's. A precise and regular observer, he contributed to the smooth running of the Paris observatory and to the success of different geodesic undertaking. Yet he was not responsible for any important innovation. His diverse observations in physics, meteorology, and the natural sciences simply attest to the high level of his intellectual curiousity. Although his rejection of infinitesimal calculus may have rendered a part of his mathematical work sterile, his early works in projective, analytic, and applied geometry place him anmong the best of the followers of Desargues and Descartes. Finally, his diverse knowledge and artistic, technical, and scientific experience were factors in the grouwth of technological thought, the advance of practical mechanics, and the perfecting of graphic techniques.

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Some of La Hire's manuscripts are preserved in the Archives of the Académie des Sciences de Paris and in the Library of the Institut de France (copy of the *Brouillon projet* of Desargues, "La pratique du trait dans la coupe des pierres")

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