Arbogast, Louis François Antoine | Encyclopedia.com

(*b*. Mutzig, Alsace, 4 October 1759; *d*. Strasbourg, France, 18 April 1803)

mathematics.

There is no exact information on Arbogast's early years nor on his studies. He is registered as a nonpleading lawyer to the Sovereign Council of Alsace about 1780, and it is known that he taught mathematics at the Collège de Colmar about 1787. In 1789 he moved to Strasbourg, where he taught the same subject at the École d'Artillerie. He also was professor of physics at the Collège Royal, and after it was nationalized he served as director from April to October 1791. He then became rector of the University of Strasbourg. In 1790 he joined the society known as the Amis de la Constitution. He was a noted person in the Commune of Strasbourg, and in 1791 was elected a deputy to the Assemblèe Législative and, in the following year, deputy from Haguenau to the Convention Nationale.

At the first of these assemblies, he and Gilbert Romme, Condorcet's closest collaborator, were on the committee of public instruction. Arbogast was the author of the general plan for public schools at all levels, which was brought before the convention but not adopted. He was responsible for the law introducing the decimal metric system in the whole of the French Republic.

Arbogast and his Alsatian colleagues were responsible for making the two assemblies aware of the efforts in Alsace toward building up a teaching force, as well as introducing the methods of pedagogy used in Germany. This information was useful in the establishment of the École Normale in the year III (1795).

Although he had been made *instituteur d'analyse* (probably professor of calculus) at the École Centrale de Paris (now École Polytechnique) in 1794, Arbogast taught only at the École Préparatoire. In this temporary institution an accelerated course of three months was given to 392 students before they were divided into three groups, which then proceeded to finish their studies in one, two, or three years.

In July 1795 Arbogast was entrusted with the planning of the École Centrale du Bas-Rhin, which replaced the abolished university. There he held the chair of mathematics from 1796 until 1802.

Arbogast was elected corresponding member of the Académie des Sciences in 1792 and an associate nonresident member of the Institut National (mathematics section, first class) four years later.

Arbogast's interest in the history of mathematics led to his classification of papers left by Marin Mersenne. He also amassed an important collection of manuscripts that are for the most part copies, in his writing, of the originals of memoirs or letters of Pierre Fermat, René Descartes, Jean Bernoulli, Pierre Varignon, Guillaume de L'Hospital, and others. At Arbogast's death these manuscripts were collected by his friend Francais. They were bought in 1839 by Guglielmo Libri, the inspector of libraries, from a bookseller in Metz. After Libri's committal for trial on charges of malfeasance, his escape, and the seizure of his property, some of Arbogast's copies were deposited at the Bibliothèque Nationale in Paris. Other documents sold by the unscrupulous historian of science to Lord Ashburnham have also come to rest there. Other copies are now in the Laurenziana Library, Florence. The collection gathered by Arbogast became extremely valuable when definitive editions of the complete works of Fermat and Descartes, and of Mersenne's correspondence, were published.

In 1787 Arbogast took part in a competition organized by the Academy of St. Petersburg on "the arbitrary functions introduced by the integration of differential equations which have more than two variables," the question being "Do they belong to any curves or surfaces either algebraic, transcendental, or mechanical, either discontinuous or produced by a simple movement of the hand? Or shouldn't they legitimately be applied only to continuous curves susceptible of being expressed by algebraic or transcendental equations?"

The Academy was thus requesting a drastic settlement of the dispute between Jean d'Alembert, who adopted the second point of view, and Leonhard Euler, partisan of the first.

Arbogast won the prize and was even bolder than Euler in his conclusions. He showed that arbitrary functions may tolerate not only discontinuities in the Eulerian sense of the term, but also "combinations of several portions of different curves or those drawn by the free movement of the hand," that is, discontinuities in the sense afterward used by Augustin Cauchy.

Two years later, Arbogast sent a report to the Académie des Sciences de Paris on the new principles of differential calculus. This was never published, but Joseph Lagrange mentions it in 1797 as setting forth the same idea that he had developed in 1772, an idea that is the fundamental principle of his theory of analytic functions, "with its own developments and applications."

In speaking of his report in the Preface to *Calcul des dérivations*, Arbogast recalled the general ideas that anticipate Cauchy's and Niels Abel's ideas on the convergence of series. He added, "It caused me to reflect on fundamental principles … I then foresaw the birth of the first inkling of the ideas and methods which, when developed and extended, formed the substance of calculus of derivatives."

The principal aim of the calculus of derivatives, as Arbogast understood it, was to give simple and precise rules for finding series expansions. In order not to stay in the domain of pure theory, he used his rapid methods to find important formulas that were reached more laboriously by some of the great geometers.

Arbogast's work is dominated by a general idea that has become increasingly important in science and that until then had barely been anticipated: operational calculus. His only followers in this field were the brothers Fran÷ais, then Fran÷ois Servois. But he was part of a vast mathematical movement that later included such names as Cauchy, George Boole, Sir William Rowan Hamilton, and Hermann Grassmann.

Arbogast clearly saw the difference that should be made between function and operation. When he defined his method of the "separation of the scale of operations," he said (*Traité des dérivations*, Preface);

This method is generally thought of as separating from the functions of variables when possible, the operational signs which affect this function. Then of treating the expressions formed by these signs applied to any quantity whatsoever, an expression which I have called a scale of operation, to treat it, I say, nevertheless as if the operational signs which compose it were quantities, then to multiply the result by the function.

Arbogast appears in his mathematical work as a philosophical thinker whose ideas prefigured many mathematical notions of modern times, such as the introduction into analysis of discontinuous functions, the limitation of certain methods of algebra to what are today known as holomorphic functions, the necessity for care in the use of infinite series, and the conception of calculus as operational symbols, disregarding the quantities or functions on which they are based.

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Jean Itard