The influence of French mathematicians at the end of the eighteenth century upon the teaching of mathematics in American colleges

At first, American mathematics history was built with the help of some mathematicians from England. But around the end of the nineteenth century, French mathematics started penetrating the United States. The names of the greatest and the most influential French mathematicians on the United States in those periods were Lagrange, Laplace and Legendre.

Joseph-Louis Lagrange (1736-1813) was a professor at the École Normale in 1795 and at the École Polytechnique in 1797. Both schools emerged during the French revolution with one of their aims to advance sciences. Thus both established a tradition of sound mathematical training as the basis for all of their works. Among those two schools, the École Polytechnique provided an inspiration to the United States Military Academy at West Point. Besides, mathematics became an important subject along with engineering. Sylvanus Thayer (1785-1872) gets credit for adopting French methods of instructions for sciences in West Point.

It was known that the Professor Benjamin Peirce (1809-1880), from Harvard University, was the first professor to use Lagrange's *Mécanique Analytique* (1788) for his advanced science courses at the Lawrence Scientific School in 1842 [Simons 106].

A contemporary of Lagrange was Pierre-Simon Laplace (1749-1827). Laplace also taught mathematics in a military school in Paris, the École Normale, and the École Polytechnique. One of the Laplace's works, *Mecanique celeste* (5 vols., 1799-1825), was translated into English by an American, Nathaniel Bowditch (1773-1838), during 1829-1839 in Boston. Bowditch's complete and thorough translation was extremely valuable to the mathematics history of the United States since very few people could read the original work with full understanding at that time. Again Professor Peirce used Vol.I of this translation in a course offered at Lawrence Scientific School in 1848 [Simons 108].

The third great mathematician associated with Lagrange and Laplace was Adrien-Marie Legendre (1752-1833). He also taught, like Laplace, at the military school in Paris, later in the École Normale, and the École Polytechnique. He was also a geodetic surveyor. He, too, produced works of outstanding importance. His comprehensive textbooks, especially *Elements de geometrie* (1794), *Exercices du calcul integral* (3 vols., 1811-1819), and *Traite des fonctions elliptiques et des integrals euleriennes* (1827-1832) were for a long time authoritative. His *Elements de geometrie* passed through many editions and was translated into many languages [Struik 145-146]. In America, the first translation of Legendre's *Elements de Geometrie* was made by John Farrar (1779-1853), Hollis professor of mathematics at Harvard from 1807 to 1836. His first translation appeared in 1819 and was followed by five other editions [Simons 110-111]. Farrar translated many more of French works into English, including Algebra and Trigonometry, and he deserves credit for changing the primary influence on American mathematics from England to France.

The work of Legendre in English appeared again in *Elements of Geometry and Trigonometry with notes. Translated from the French of M.A. Legendre.* This book was translated into English by Thomas Carlyle and edited by David Brewster, LL.D. (1781-1868) from Edinburgh in 1822 [Simons 112]. Six years after Brewster's first edition, James Ryan published a revised and altered form, *Elements of Geometry with notes translated from the French of A.M. Legendre…*By David Brewster, LL.D…, for the use of the West Point. This second version appeared in New York in 1828. James Ryan was a publisher who assembled

several books and journals, including Robert Adrian's *Mathematical Diary* from 1828 to 1832 [Simons 113].

The influence of Legendre's works on the Unites States did not stop there. Charles Davies (1798-1876), a mathematics professor at West Point and a successful textbook author, translated Legendre's *Elements de Geometry* by using Brewster's works and published the first edition in 1834. He made a series of editions until his 28th edition appeared in 1890. Moreover, the Day and Thomson series took advantage of the popularity of this author and we find *Elements of Geometry: On the basis of Dr. Brewster's Legendre…* By James B.Thomson, A.M. 1844, with five editions up to 1855 [Simons 114]. Farrar's Legendre and Davies' series were used in many schools and colleges throughout the United States for many years.

Gaspard Monge (1746-1818) was the director of the École Polytechnique. As the director of that school, he was also known as the leader of the group of mathematicians who were connected with this institute [Struik 147]. Claudius Crozet (1789-1864), the École Polytechnique's graduate who studied under Monge, came to the Military Academy at West Point through the Superintendent Thayer. Crozet's book, *The treatise on Descriptive Geometry for the use of the cadets of the United States Military Academy* (1821), used Monge's published lectures, *Geometrie descriptive* (1795-1799), as its source.

Louis Pierre Marie Bourdon (1779-1854) was a mathematician who taught at the École Polytechnique and his outstanding work, *Elements d'Algebra* (1817), was used as the source for many American writers [Simons 115]. William Smyth used Bourdon's work for his *Elements of Algebra* (1830) and published it in Portland. This book went through five more editions.

In1831, Bourdon's Algebra came out in two translations by two different authors in the same year. The first book, *Elements of Algebra, by Bourdon, translated from the French for the use of colleges and schools*, was published in Boston by Hilliard, Gray, Little, and Wilkins. Although there is no clear indication of the translator of the book, it seems that John Farrar from Harvard and De Morgan from London University made the efforts for this work. The second book*, Elements of Algebra translated from the French of M.Bourdon for the use of the cadets of the U.S. Military Academy,* was translated by Edward C. Ross, a West Point graduate, in New York. This book served as a foundation of Davies's Bourdon [Simons 117]. Indeed, Charles Davies's revised and adapted version of Bourdon's work appeared form 1835 to 1875 as a series with twenty-two editions. Charles Davies, a graduate of West Point, is well-known for his series of textbooks and his contributions helped American mathematics history changing from Britain to France and his Legendre and Bourdon were used in many schools and colleges for many years.

Jean-Baptiste Biot (1774-1862) was one of the mathematicians who developed the analytical geometry of conics and quadrics. His *Essai de geometrie analytique* (1802) was recognized as the source of our present textbooks of analytic geometry. [Struik 147]. This work formed as the one of the bases for Charles Davies's *Element of Analytical Geometry* (1836). Biot's work was again translated into English by Francis H. Smith (1812-1890) for the use at the Virginia Military Institute in 1840 and the second and third edition came out in 1846 and 1868 [Simons 119-120].

Sylvestre Francois Lacroix (1765-1843) also taught at the École Normale, the École Polytechnique, and the College de France. [Simons 120]. A whole continent of students learned calculus from his book, *Traite du calcul differential et du calcul integral* (2 vols., 1797) [Struik 147]. Charles Davies used this book for his *Elements of the Differential and Integral Calculus*, which came out form 1836 to 1873 in six editions. John Farrar also translated Lacroix's Algebra

for the use of students in the University at Cambridge, New England, in 1818. This was the first work translated by an American for use in American colleges [Simons 121].

The introduction of French mathematics helped make American mathematics history elegant. From then until now, the outstanding college textbook makers successfully expended mathematics with much of their own labor and talents. Gradually American mathematics was brought up to the world standard.

Written Sources:

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2. Dirk J. Struik, *A Concise History of Mathematics*, 4th ed., Dover, New York, 1987, pp.145 – 149.

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