放眼世界的数学星空

Mathematicians Born in France

法国数学家（一）

英文版

石雷 张宝义／编

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藏书章

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前　言

入世后，我国经济和社会发展与世界接轨的进程加快，需要大量的国际化的复合型人才。为迎接入世挑战，培养出更多的国际化的复合型人才，进一步深化素质教育，我国实施了新一轮的中小学课程改革。

在此改革中，“双语教学”已成为外语教学改革中一道亮丽的风景线。当前，我国大中城市的部分高校及中小学、一些境外来华办学机构以及有些民办学校已在实施“双语教学”。“双语教学”已成为教育界的热门话题，并呈现出良好的发展前景。

为顺应“双语教学”的新潮流和大趋势，我们出版了《放眼世界的数学星空》丛书，本丛书介绍了法国数学家、俄罗斯数学家、中国数学家、印度数学家，他们的伟大成就吸引着我们，激励着我们去学习、去拼搏。与此同时，还可以使您在英语字母点缀的星空里，轻松领略数学家

们的才华，并且使您真正提高阅读能力、巩固和扩大英语词汇量、增强使用英语的自信心。

本丛书在选编过程中由于涉及面广，时间仓促，有误之处，敬请广大读者朋友们热忱提出批评和建议，以便今后修订完善。

编　者

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Mathematicians Born in France

André Marie Ampère

Born: 20 **Jan** 1775 **in Lyon, France**

Died: 10 **June** 1836 **in Marseilles, France**

André－Marie Ampère's father, Jean－Jacques Ampère, was a prosperous man who owned a home in Lyon and a country house in Poleymieux, which is only 10km from Lyon. Up till André－Marie was seven years old the family spent most of the year in Lyon except the summer months which were spent at Poleymieux. However, in 1782, the home at Poleymieux became their main residence since André－Marie's father wished to spend more time on his son's education. Only a short time in

winter was spent at Lyon where André－Marie's father saw to his business interests.

Despite not attending school, André－Marie was to be given an excellent education. He describes this education in autobiographical writings (rather strangely referring to himself in the third person)：－

> *His father, who had never ceased to cultivate Latin and French literature, as well as several branches of science, raised him himself in the country near the city where he was born. He never required him to study anything, but he knew how to inspire in him a desire to know. Before being able to read, the young Ampère's greatest pleasure was to listen to passages from Buffon's natural history.*

Ampère read articles from L'Encyclopédie many of which, Arago remarked many years later, he could recite in full in later life. Arago also claims that Ampère read the Encyclopédie starting at volume 1 and reading the articles in alphabetical order. Whether Ampère's later desire for classification in all subjects arose from this education, or whether he enjoyed Buffon and the Encyclopédie because of a natural liking for classifying, is hard to say.

It has been claimed that Ampère had mastered all known mathematics by the age of twelve years but this seems somewhat of an exaggeration since, by Ampère's own account, he did not start to read elementary mathematics books until he was 13 years old. However Ampère was always one to feel very confident in his own abilities and he certainly began to develop his own mathematical ideas very quickly and he began to write a treatise on conic sections. Ampère had no contacts with anyone with any depth of mathematical knowledge so it is not surprising that he felt that his ideas were original.

While still only 13 years old Ampère submitted his first paper to the Académie de Lyon. This work attempted to solve the problem of constructing a line of the same length as an arc of a circle. His method involves the use of infinitesimals but since Ampère had not studied the calculus the paper was not found worthy of publication. Shortly after writing the article Ampère began to read d'Alembert's article on the differential calculus in the Encyclopédie and realised that he must learn more mathematics.

After taking a few lessons in the differential and integral calculus from a monk in Lyon, Ampère began to study works by Euler and Bernoulli. He then acquired a copy of the 1788 edi-

tion of Lagrange's Mécanique analytique and began serious study of the work. Ampère writes (again writing about himself in the third person): –

… the reading of [Mécanique analytique] had animated him with a new ardour. He repeated all the calculations in it …

However his life was soon to be shattered. The French Revolution began with the storming of the Bastille on 14 July 1789 but the effect on the Poleymieux region was not very great at first. Ampère's father kept out of trouble until late in 1791 when he accepted the position of Justice of the Peace in Lyon. This post made it virtually impossible for him to avoid trouble but the first tragedy to hit the family was in 1792 when André – Marie's sister died. The city of Lyon refused to carry out instructions from Paris and the city was besieged for two months. On the fall of the city Ampère's father was arrested for issuing an arrest warrant for the Jacobin Chevalier who had then been put to death. Ampère's father went to the guillotine with remarkable composure writing to Ampère's mother from his cell: –

I desire my death to be the seal of a general reconciliation between all our brothers; I pardon those

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who rejoice in it, those who provoked it, and those who ordered it…

The effect on Ampère of his father's death was devastating. He gave up his studies of Mécanique analytique and did not return to the study of mathematics for 18 months. He only returned to something like his old self when he met a girl, Julie, who he fell deeply in love with. Julie seemed less attracted to Ampère:-

He has no manners; he is awkward, shy and presents himself poorly.

Despite this coolness they were engaged to be married in 1797 and Ampère decided he better show that he could earn a living so began tutoring mathematics in Lyon. He married Julie in 1799 and their son Jean-Jacques was born in 1800. Ampère continued tutoring mathematics until 1802 when he was appointed professor of physics and chemistry at Bourg École Centrale. This was a difficult time for Ampère since Julie became ill before he made the move to Bourg leaving her at Poleymieux.

While Ampère was in Bourg he spent much time teaching physics and chemistry but his research was in mathematics. This research resulted in him composing a treatise on probabili-

ty, The Mathematical Theory of Games, which he submitted to the Paris Academy in 1803. Laplace noticed an error, explaining the error to Ampère in a letter, which Ampère was able to correct and the treatise was reprinted. In fact the treatise was modified a number of times and Ampère was reluctant to call it completed for fear that further changes might be required. This work was followed by one on the calculus of variations in 1803.

After a year in Bourg, Ampère moved closer to Poleymieux being appointed to a mathematics position at the Lycée in Lyon on Delambre's recommendation. His time spent in Lyon had been made difficult due to the continuing decline in his wife's health. Mathematically he continued to produce good work, this time an interesting treatise on analytic geometry. Like a number of other mathematicians, Ampère seemed able to concentrate on his theorems despite the personal tragedy around him and, sadly, this would be required of him throughout his unhappy life. After his wife died in July 1803, Ampère was left with feelings of guilt for he had lived apart from his wife during much of their short marriage. He decided to leave Lyon for Paris. Hofman writes in [4] regarding his feelings following his wife's death: -

His subsequent depression contributed to his de-

cision to take the earliest opportunity to leave Lyon for new surroundings in Paris. Later he would regret this decision. The Lyon friends who attempted to fill the emotional void left by Julie's death were missed painfully. Although Ampère gradually adjusted to the priority disputes and infighting of the Parisian scientific community, he always longed for a return to the intellectual life he experienced in Lyon.

By this time Ampère had a fair reputation as both a teacher of mathematics and as a research mathematician and on the strength of this reputation he was appointed répétiteur (basically a tutor) in analysis at the École Polytechnique in 1804. Without a formal education and formal qualifications his appointment is surprising but shows that his potential was recognized at this stage. His life, already containing many tragedies, did not improve and he embarked on a disastrous marriage. Lagrange and Delambre attended his wedding to Jenny on 1 August 1806 but, before the birth of their daughter on 6 July 1807, the couple were living apart and were not on speaking terms. They were legally separated in 1808 and Ampère was given custody of their daughter Albine.

Appointed professor of mathematics at the École Polytechnique in 1809 he held posts there until 1828. Ampère and Cauchy shared the teaching of analysis and mechanics and there was a great contrast between the two with Cauchy's rigorous analysis teaching leading to great mathematical progress but found extremely difficult by students who greatly preferred Ampère's more conventional approach to analysis and mechanics. Ampère was appointed to a chair at Université de France in 1826 which he held until his death.

In Paris Ampère worked on a wide variety of topics. Although a mathematics professor, his interests included, in addition to mathematics, metaphysics, physics and chemistry. In mathematics he worked on partial differential equations, producing a classification which he presented to the Institut in 1814. This seems to have been a crucial step in his election to the Institut National des Sciences in November 1814 when he defeated Cauchy, receiving 28 of the 56 votes cast.

Ampère was also making significant contributions to chemistry. In 1811 he suggested that an anhydrous acid prepared two years earlier was a compound of hydrogen with an unknown element, analogous to chlorine, for which he suggested the name fluorine. After concentrating on mathematics as he

sought admission to the Institut, Ampère returned to chemistry after his election in 1814 and produced a classification of elements in 1816.

Ampère also worked on the theory of light, publishing on refraction of light in 1815. By 1816 he was a strong advocate of a wave theory of light, agreeing with Fresnel and opposed to Biot and Laplace who advocated a corpuscular theory. Fresnel became a good friend of Ampère's and lodged at Ampère's home from 1822 until his death in 1827.

In the early 1820s, Ampère attempted to give a combined theory of electricity and magnetism after hearing about experimental results by the Danish physicist Hans Christian Orsted. Ampère formulated a circuit force law and treated magnetism by postulating small closed circuits inside the magnetized substance.

It is worth commenting on how quickly Ampère produced this theory, the inspiration striking him immediately he heard of Orsted's experimental results. Orsted's work was reported the Academy in Paris on 4 September 1820 by Arago and a week later Arago repeated Orsted's experiment at an Academy meeting. Ampère demonstrated various magnetic / electrical effects to the Academy over the next weeks and he had discovered

electrodynamical forces between linear wires before the end of September. He spoke on his law of addition of electrodynamical forces at the Academy on 6 November 1820 and on the symmetry principle in the following month. Ampère wrote up the work he had described to the Academy with remarkable speed and it was published in the Annales de Chimie et de Physique.

Ampère was assisted over the next few years in his work by Felix Savary whose help in getting Ampère to write up his results was invaluable [4]: -

> ... *beginning with the memoir he completed early in* 1823, *Savary now made much more creative contributions. But more than his creativity, it was Savary's discipline and ability to concentrate at length on specific problems that proved especially valuable to Ampère. There is room to speculate that, without Savary's aid. Ampère might never have found time to complete the detailed calculations required to apply his force law to magnetic phenomena.*

However Ampère was not the only one to react quickly to Arago's report of Orsted's experiment. Biot, with his assistant Savart, also quickly conducted experiments and reported to the

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