Euler: a mathematician without equal and an overall nice guy

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Mathematicians are an odd bunch. Isaac Newton was decidedly unpleasant, secretive and resentful while Carl Friedrich Gauss, according to several biographies, was cold and austere, more likely to criticize than to praise. It is frequently claimed that a disproportionate number of mathematicians exhibit signs of autism and have significant difficulties with social interaction and everyday communication.

It is true that some of the greatest fit this stereotype, but the incomparable Leonhard Euler is a refreshing counter-example. He was described by his contemporaries as a generous man, kind and loving to his 13 children and maintaining his good-natured disposition even after he became completely blind. He is comforting proof that a neurotic personality is not essential for mathematical prowess.

Euler, born in Basel in 1707, showed early signs of genius. He studied with Johann Bernoulli, one of shining stars in a dynasty of brilliant Swiss mathematicians. Euler learned much from Bernoulli and was soon to outshine his brilliant mentor. With little chance of a position in Switzerland, Euler accepted a post at the Imperial Academy in St Petersburg. Over a fourteen-year stay, he made many innovative advances in mathematics and mechanics. He also lost the sight of his right eye.

Sojourn in Potsdam

In 1741, as political conditions in Russia became threatening, Euler accepted an invitation from Frederick the Great, King of Prussia, to move to the Royal Academy in Berlin. His work there resulted in election to the Royal Society (London) and the Paris Academy. King Frederick was most interested in military applications of science, and Euler had to undertake studies in ballistics, navigation, canal design and other practical tasks.

Having fallen out of favour with the King, Euler returned to St Petersburg in 1766. His complete loss of sight seemed not to slow his output and he continued to produce work of great originality and ingenuity up to his death seventeen years later.

Euler had a phenomenal memory. In his youth, he learned the entire text of Virgil's *Aeneid* and he could recite it flawlessly into old age. He knew the first hundred prime numbers and also their squares, cubes and powers up to the sixth degree. And he had a remarkable capacity for complicated mental calculations. A biographer wrote that Euler calculated without effort, “just as men breathe, as eagles sustain themselves in the air”.

A Prolific Mathematician

The vast body of mathematics owes more to Leonhard Euler than to any other single person. His achievements cover an enormous range and underlie all major branches of mathematics. In 1911, scholars began publishing his collected works. His *Opera Omnia* includes some 900 articles, many of great profundity, written in German, French and Latin. With 80 volumes so far, this project is only now nearing completion.

Euler revolutionised mathematics, greatly extending its boundaries. He was inexhaustible: no other mathematician has been so prolific. His work embraces calculus, differential geometry, number theory and infinite series. In physics, he made major contributions to analytical mechanics and hydrodynamics. He laid the foundations for several new branches of mathematics: graph theory, the calculus of variations and partial differential equations.

Many results attributed to other mathematicians are to be found in Euler's works. He had a major influence on mathematics through the nineteenth century, and continues to inspire mathematicians today. His textbooks remained as essential sources for a century or more.

Euler died suddenly in 1783. Although by then completely blind, he had continued to produce striking new results. The preparation for publication of a backlog of his work kept his assistants busy for a further four decades.

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