ADA LOVELACE   (December 10, 1815 – November 27, 1852)

by HEINZ KLAUS STRICK, Germany

For the mathematician CHARLES BABBAGE, she was the *Enchantress of Numbers*; for the feminists of our day, she is considered the prophetess of the computer age; the American Department of Defence has even named a programming language after her (Ada).

She was born AUGUSTA ADA BYRON, and after her marriage she took the title AUGUSTA ADA KING COUNTESS OF LOVELACE. Her father was the English poet GEORGE GORDON BYRON (later the sixth BARON BYRON), her mother ANNE ISABELLA MILBANKE (later the eleventh BARONESS WENTWORTH).
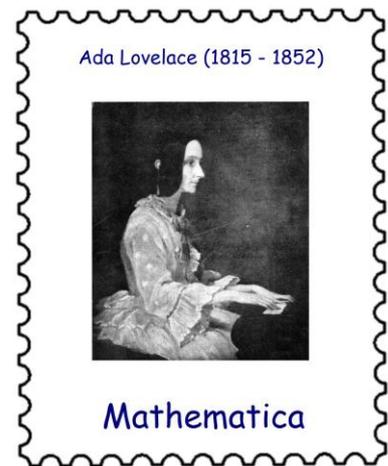
From Henry Phillips' painting *Ada Lovelace at the Piano* (1852)
(https://commons.wikimedia.org/wiki/File:Ada_Lovelace_in_1852.jpg)

The marriage of Ada's parents, contracted on 2 January 1815, was short-lived: on 16 January 1816, one month after the birth of their daughter, the couple separated because of irreconcilable differences – the passionate poet, prone to fits of rage, mocked his mathematics-loving, more rationally thinking wife as the *Princess of Parallelograms* and she considered her husband mentally ill. When the wife's mother publicly hinted at her son-in-law's homosexuality, which was strictly forbidden, he decided to formally consent to the separation, renounced the right to raise the child and left England. After stays on Lake Geneva and in Venice, he joined the Greek freedom movement. He died in 1824 without ever having made contact with ADA.

He only remembers his daughter in a poem:

> *Is thy face like thy mother's, my fair child!*
> *Ada! sole daughter of my house and heart?*
> *When last I saw thy young blue eyes they smiled,*
> *And then we parted, – not as now we part,*
> *But with a hope ...*

ADA's mother wanted to prevent any traits inherited from her father from coming to the fore through a strict upbringing. For example, when LADY BYRON noticed that her daughter enjoyed the private tutor's geography lessons more than his arithmetic lessons, she replaced geography with additional mathematics lessons.

But she actually showed little interest in the development of her daughter, who was often ill as a child, and mostly left her to the care of her grandmother.

At the age of twelve, ADA decided to write a book about flying; she studied the anatomy of birds and considered which materials are best suited for building wings. She also thought about how to power a flying machine with the help of steam.

At the age of 18, ADA BYRON was introduced at court and could now take part in the events of *high society*. In this context, she met MARY SOMERVILLE and CHARLES BABBAGE, among others. From their first meeting, she was fascinated by BABBAGE's idea of building an *analytic engine*.

ADA developed a special relationship with MARY SOMERVILLE, née FAIRFAX (1780 – 1872), who came from Scotland. MARY SOMERVILLE not only invited her to attend concerts together, but also gave her a wide range of scientific ideas. MARY SOMERVILLE became a role model for her to emulate.

MARY FAIRFAX's parents had also considered a special school education for their daughter superfluous ("... the burden of abstract thinking would injure the delicate female physique ..."). By the time she was eleven, MARY had decided for herself to read all the books she could get her hands on and she also taught herself Latin.

When she heard from her piano teacher that EUCLID's *Elements* were the basis for the study of astronomy and other sciences, she worked through this book – with the support of her younger brother (who did receive extensive tuition).

MARY was married to a distant relative and her husband showed no understanding of her scientific curiosity. After his early death, she contacted JOHN PLAYFAIR, professor of natural philosophy at the University of Edinburgh, who recommended that she study NEWTON's *Principia* and PIERRE-SIMON LAPLACE's *Mécanique Céleste*.

With the physician WILLIAM SOMERVILLE, her second husband, she moved to London, where access to all sciences opened up to her through her husband, who became a member of the *Royal Society*. After a first publication on the magnetic properties of violet light, she was encouraged to translate the *Mécanique Céleste* into English.

The work – provided by her with detailed commentaries – became a great financial success and appeared in ten editions; the commentaries were even translated into German and Italian.

In 1835, she and the astronomer CAROLINE HERSCHEL (WILLLIAM HERSCHEL's sister) became the first women to be admitted to the *Royal Astronomical Society*.

MARY SOMERVILLE went on to publish other books on physics, geography and microscopy. Incidentally, the term *scientist* for a scientist comes from her.

The Royal Bank of Scotland honoured her in 2017 by printing her portrait on a ten-pound note.
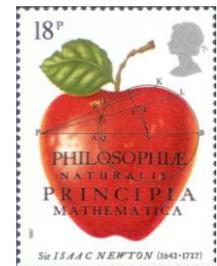
In 1835 ADA BYRON married Lord WILLIAM KING, ten years her senior, and in 1838 she inherited the title of COUNTESS OF LOVELACE. Only after the birth of three children did she again find the time to occupy herself with scientific questions. In particular, she wanted to understand BABBAGE's project and therefore wanted to deepen her knowledge of mathematics – she found an extremely competent teacher in AUGUSTUS DE MORGAN.

DE MORGAN held a chair in mathematics at University College in London and because of his numerous publications, especially on abstract algebra and formal logic (*DE MORGAN's laws*), he enjoyed great renown.
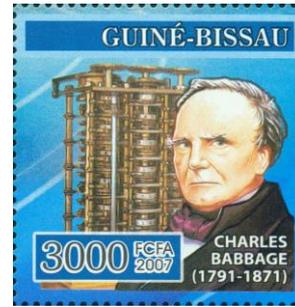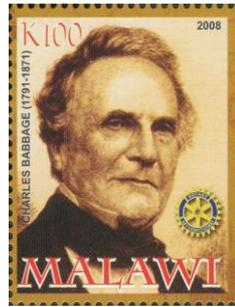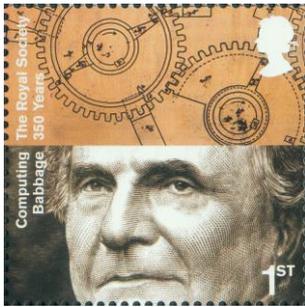
CHARLES BABBAGE, one of the founders of the *Royal Astronomical Society* and holder of the famous *Lucasian Chair of Mathematics* in Cambridge since 1827, had been pursuing the plan to build a powerful calculating machine for years. For this purpose, he had already received start-up aid from the state in 1823, which was repeatedly topped up. But he was unable to keep his promise to build the *difference engine* within three years: a machine made up of cogwheels, levers and axles. He constantly had new ideas and changed his plans.

Finally, he thought about a more comprehensive machine, the *analytical engine*. While the *difference engine* could only perform additions, this forerunner of today's computer could be used for all kinds of calculations:

All operations were to be controlled by a programme to be read in with the help of punched cards (as with the automatic looms invented by JOSEPH-MARIE JACQUARD in 1801).

In 1840, BABBAGE had the opportunity to present his ideas at a congress in Turin. The mathematician LUIGI FEDERICO MENABREA wrote a report on this (*Notions sur la machine analytique de Charles Babbage*), which ADA LOVELACE translated into English.

Full of enthusiasm ("... just as the Jacquard loom weaves flowers and leaves, this machine weaves algebraic patterns ...") she supplemented the text with her own comments. MENABREA's report was thus expanded to four times its original size. At BABBAGE's suggestion, she added a concrete example in which she explained what kind of instructions the machine would need to calculate the so-called BERNOULLI numbers.

Her writing was published in 1843 under the abbreviation AAL and generally praised but after that, however, interest in it was lost, as the construction of the *analytical engine* was not realised. It is not until the 20th century that the significance of her *Notes*, in particular the algorithm she described, was recognised.

In the following years, ADA LOVELACE thought about further publications, but was unable to realise any of the planned projects. Her relationship with her husband deteriorated as he showed little understanding for her scientific ambitions. She had several affairs and her alcohol consumption increased alarmingly. In addition, she had a passion for betting on horses – and a supposedly safe betting system developed by her led to dramatic debt. She broke with her mother when she realised that she had done everything to put her father in a bad light with her.

In early 1852 she was diagnosed with incurable uterine cancer. At her request, she was buried next to her father, whom she never knew, in a church in Nottinghamshire.