4. Genetics

5. Andre Marie Ampere

Andre Marie Ampere is a father of electrodynamics. The man whose name we now remember on every plug, socket and fuse. Though his life continued to be marred by tragedy and unhappiness, Ampere grew to become a respected mathematician and chemist, and an electrical physicist of world renown. Maxwell dubbed him the Newton of electricity.

Even if Ampere had died in the early months of 1820 he would still be honoured for his contributions to mathematics and chemistry. In France, for example, Avogadro’s law is known as the Avogadro-Ampere law, Ampere having arrived at it just three years later. He was also narrowly beaten to the recognition of chlorine (1810) and iodine (1813) as elements, this time by Humphrey Davy. However it was his monumental work on electrodynamics from 1820 to 1827 which earned him a place in history. It was he who founded the subject and he who crafted the beauty of its structure.

Andre Marie Ampere was born in Lyons on 22nd January 1775. His father was a well-to-do merchant who moved his family out of the city soon after his son was born. Ampere grew up in a village. His home was his school. His education, provided and supervised by his father, seems to have consisted mainly

of studying a large variety of books. In this way he discovered and developed interests in science, metaphysics, mathematics and poetry, even teaching himself Latin in order to read the mathematical works of Euler and Bernoulli.

Besides science and mathematics (and Latin!) Ampere also received a thorough grounding in the Roman Catholic faith. As with Oersted, his Christianity helped determine his view of nature. Throughout his life the teachings of Christianity and those of the 18th century philosophers, though not always mutually supportive, had great influence on him.

After the tragedy of his father’s grotesque death, a year passed before Ampere began to rejoin the world, partly through a study of botany and by writing poetry. By the time he was 22 he had met the girl he was to marry, but had no skilled trade and only a small inheritance. Financial worries were never to be far away.

The couple married in 1799 and settled in Lyons, with Ampere earning a modest living by teaching mathematics. His first published paper, on the theory of games of chance, earned him a step up the academic ladder to the post of professor of physics and chemistry at Bourg, near Lyons, and more money.

Tragedy however struck again. After less than four years of very happy marriage his wife died. Plunged into grief and despair, Ampere left Lyons, with all its memories, for Paris.

There he made an unfortunate second marriage and was swindled by his new father-in-law. After a divorce he set up a new home in Paris with his mother and an aunt, and his two children. And there he conducted his immortal work.

Paris was now his home. He obtained a position at the renowned École Polytechnique, became a member of the Institut Imperial (1814), and in 1819 began teaching at the University of Paris. His contemporaries included Arago, Biot, Savart, Laplace and Poisson. It is sad that he was the epitome of the absent-minded professor – even forgetting a dinner date with the Emperor Napoleon, so the story goes. But it was Ampere who became the major contributor to the new science of electrodynamics, the name which he gave to the newly-discovered phenomena. “It expresses their true character, that of being produced by electricity in motion”, he wrote. The older type of electricity he named electrostatics – “phenomena produced by the unequal distribution of electricity at rest in the bodies in which they are observed” (1822).

As well as giving us these new words Ampere carefully defined the terms electric current and electric tension (voltage), phrases which had until then been used very loosely. Ohm’s Law, however, was still a few years away (1826-27). After verifying Oersted’s work Ampere expressed it as a law: if an observer had a current flowing from his feet to his head then a needle placed in front of him would have its north-seeking pole deflected to his left. Later this was reexpressed as the right-hand screw rule.

With electricity and magnetism nоw know to be related the question arose as to which of the two was the fundamental phenomenon. To Ampere, electrical “fluids” seemed more likely than magnetic “fluids” as the fundamental cause, and so he formed a hypothesis that electric currents were the cause of magnetism. If that were true, then when an electric current caused a magnetic compass needle to move it could only be the result of electricity acting upon electricity. Therefore, he reasoned, two electric currents should interact via their magnetic effects. In a very clever experiment, suggested by Laplace, two parallel wires each carrying a current were shown to attract one another magnetically when the currents were in the same direction and repel when the currents were in opposite directions.

For the first time an experiment on magnetism had been performed without a magnet. Ampere proved that these attractions and repulsions were not due to electrostatic phenomena. He described them as voltaic so as to emphasise the point.

The name of Volta, the Italian inventor of the electric battery, was passing into electrical terminology.

Ampere also gave us the word galvanometer. He simply placed the conductor horizontally above or below the magnetic compass needle. The direction of movement of the needle indicated the direction of flow of the current through the conductor and the angle indicated the magnitude. He named the instrument after Galvani, the Italian usually credited with the discovery of the electric current. It was left to someone else to name its unit of measurement after Ampere himself. He also suggested a way of using a keyboard at the transmitter to make transmission easier.

Meanwhile in Germany, Schweiger had made a more sensitive galvanometer using a coil of wire of about 100 turns with a compass needle pivoted within it. Announced on 13th September, it was this multiplier that became important in the early telegraphs.

Ampere also used coils of wire which he named solenoids. He and others showed that such coils could imitate all the effects of a magnet. A bar magnet itself could be explained, he suggested, by assuming the presence of circular electrical currents within it, running parallel to its axis. Such concentric currents might, he speculated, originate from contact between the molecules of the material. It was now only a short step for him to explain the Earth’s magnetism as being caused by electric currents running from east to west.

For much of his life Ampere seems never to have been far from unhappiness, a stunning contrast to the public service he rendered. Late in life, it is said, he confessed that only a few years had brought him real happiness. He died alone in Marseilles on 10th June 1836, aged 61.

Ampere was without doubt the leading light of the period, performing many beautiful experiments and consolidating electrodynamics into a mathematical subject. In 1827 he published a synthesis of his work which became famous and is still the foundation of the mathematical theory of electrodynamics. The capstones that history awarded Ampere are his work on electrodynamics and the naming of the unit of electric current after him. And, of course, the words he coined: electrodynamics, electrostatics, galvanometer, voltaic and solenoid.

<https://english-direct.ru/angliyskiy-dlya-inzhenerov/texts/628>

6. Alfred Nobel

Since 1901, the Nobel Prize has been honoring men and women from all corners of the globe for outstanding achievements in physics, chemistry, medicine, literature, and for work in peace. The foundations for the prize were laid in 1895 when Alfred Nobel wrote his last will, leaving much of his wealth to the establishment of the Nobel Prize.

Alfred Nobel was born in Stockholm on October 21, 1833. His father Immanuel Nobel was an engineer and inventor who built bridges and buildings in Stockholm. In connection with his construction work, Immanuel Nobel also experimented with different techniques for blasting rocks. Successful in his industrial and business ventures, Immanuel Nobel was able, in 1842, to bring his family to St. Petersburg. There, his sons were given a first-class education by private teachers. The training included natural sciences, languages and literature. By the age of 17, Alfred Nobel was fluent in Swedish, Russian, French, English and German. His primary interests were in English literature and poetry as well as in chemistry and physics. Alfred’s father, who wanted his sons to join his enterprise as engineers, disliked Alfred’s interest in poetry and found his son rather introverted.

In order to widen Alfred’s horizons, his father sent him abroad for further training in chemical engineering. During a two year period, Alfred Nobel visited Sweden, Germany, France and the United States. In Paris, the city he came to like best, he worked in the private laboratory of Professor T. J. Pclouze, a famous chemist. There he met the young Italian chemist Ascanio Sobrero who, three years earlier, had invented nitroglycerine, a highly explosive liquid. But it was considered too dangerous to be of any practical use. Although its explosive power greatly exceeded that of gunpowder, the liquid would explode in a very unpredictable manner if subjected to heat and pressure. Alfred Nobel became very interested in nitroglycerine and how it could be put to practical use in construction work. He also realized that the safety problems had to be solved and a method had to be developed for the controlled detonation of nitroglycerine.

After his return to Sweden in 1863, Alfred Nobel concentrated on developing nitroglycerine as an explosive. Several explosions, including one (1864) in which his brother Emil and several other persons were killed, convinced the authorities that nitroglycerine production was exceedingly dangerous. They forbade further experimentation with nitroglycerine within the Stockholm city limits and Alfred Nobel had to move his experimentation to a barge anchored on Lake Malaren. Alfred was not discouraged and in 1864 he was able to start mass production of nitroglycerine. To make the handling of nitroglycerine safer Alfred Nobel experimented with different additives. He soon found that mixing nitroglycerine with kieselguhr would turn the liquid into a paste which could be shaped into rods of a size and form suitable for insertion into drilling holes. In 1867 he patented this material under the name of dynamite. To be able to detonate the dynamite rods he also invented a detonator (blasting cap) which could be ignited by lighting a fuse. These inventions were made at the same time as the pneumatic drill came into general use. Together these inventions drastically reduced the cost of blasting rock, drilling tunnels, building canals and many other forms of construction work.

The market for dynamite and detonating caps grew very rapidly and Alfred Nobel also proved himself to be a very skillful entrepreneur and businessman. Over the years he founded factories and laboratories in some 90 different places in more than 20 countries. Although he lived in Paris much of his life he was constantly traveling. When he was not traveling or engaging in business activities Nobel himself worked intensively in his various laboratories, first in Stockholm and later in other places. He focused on the development of explosives technology as well as other chemical inventions including such materials as synthetic rubber and leather, artificial silk, etc. By the time of his death in 18%, he had 355 patents.

Intensive work and travel did not leave much time for private life. At the age of 43, he was feeling like an old man. At this time he advertised in a newspaper “Wealthy, highly-educated elderly gentleman seeks the lady of mature age, versed in languages, as secretary and supervisor of household.” The most qualified applicant turned out to be an Austrian woman, Countess Bertha Kinsky. After working a very short time for Nobel she decided to return to Austria to marry Count Arthur von Suttner. In spite of this Alfred Nobel and Bertha von Suttner remained friends and kept writing letters to each other for decades. Over the years Bertha von Suttner became increasingly critical of the arms race. She wrote a famous book, Lay Down Your Arms and became a prominent figure in the peace movement. No doubt this influenced Alfred Nobel when he wrote his final will which was to include a Prize for persons or organizations who promoted peace. Several years after the death of Alfred Nobel, the Norwegian Storting (Parliament) decided to award the 1905 Nobel Peace Prize to Bertha von Suttner.

Alfred Nobel died in San Remo, Italy, on December 10, 1896. When his will was opened it came as a surprise that his fortune was to be used for Prizes in Physics, Chemistry, Physiology or Medicine, Literature and Peace. The executors of his will were two young engineers, Ragnar Sohlman and Rudolf Lilljequist. They set about forming the Nobel Foundation as an organization to take care of the financial assets left by Nobel for this purpose and to coordinate the work of the Prize-Awarding Institutions. This was not without its difficulties since the will was contested by relatives and questioned by authorities in various countries.

Alfred Nobel’s greatness lay in his ability to combine the penetrating mind of the scientist and inventor with the forward-looking dynamism of the industrialist. Nobel was very interested in social and peace-related issues and held what were considered radical views in his era. He had a great interest in literature and wrote his own poetry and dramatic works. The Nobel Prizes became an extension and a fulfillment of his lifetime interests.

<https://ieltsmaterial.com/alfred-nobel-ielts-reading-answer/>