DAVY, AND NATURE'S MAGICIANS, 1778-1829

from

Children's Stories of the Great Scientists

by Henrietta Christian Wright

Davy was born in 1778 at Penzance, in Cornwall, where his family, who were of the middle class, had lived as farmers for over two hundred years. The country about Penzance is healthy and beautiful, diversified by hill and glen and stream, green fields and orchards, and bounded on one side by the sea, across whose waters shone the gray slopes of Mount Michael. And besides these advantages, the neighborhood possessed other attractions well calculated to charm the attention of an imaginative boy; for here were the great monuments of the Druids, the most famous in England, the massive piles seeming to hold old memories of an almost forgotten past, and here also were the not less interesting mining works, celebrated all over the world, and the source of all the wealth of Cornwall.

Such surroundings made an early impression on the mind of Davy, and, while he was yet a child, his love for the marvelous and his taste for natural history were visible in a marked degree. Penzance was then famous for its ghostly traditions of haunted houses, there being hardly a dwelling in the neighborhood that was not marked by some supernatural horror, while its proximity to the sea also made the place a popular resort for smugglers, and thus gave it an added fascination to a mind that had a leaning toward the adventurous, and it is thus not to be wondered at that the early years of the boy were filled with thoughts of the marvellous, and that life from the first was endowed with poetic and unusual interest.

All the old tales of the region were poured into his ears by his grandmother, a woman of fervid imagination, who thoroughly believed in ghosts, witches, and fairies, and when this fund failed, the Arabian Nights proved a still more fruitful source of pleasure; and when there were no more stories to be had in any way, then the boy turned story-teller himself, and, mounted on a cart, would thrill his young companions with exciting tales of sea and land, in which genii, ghosts, and smugglers played interesting parts, embellishing his narration by his own imagination, and earning a great local reputation by his dramatic representation of the events under consideration.

This taste for the marvelous, which was such a marked characteristic of his childhood, was still prominent in boyhood, and was the principal factor in his choice of a profession. The natural surrounding of his home, with its ever-changing sea and skies, the great variety of minerals produced from the mines and the various kinds of rocks that formed the outlying cliffs and headlands, all joined to awaken a keen sense of the marvels of nature and a desire to understand the laws which could produce such results. His school-days were not only devoted to the study of text-books, but were occupied with excursions, which had for their object the pursuit of natural history; mineralogical and geological specimens were eagerly sought after, and a collection of birds and fishes were also added to the young naturalist's stores.

When he was fifteen years of age, Davy was apprenticed to a physician, and from this time his studies assumed a more serious form, and he laid down a regular plan of reading, which included among other things works on botany, chemistry, and astronomy. For the next four years his time was fully occupied with these various duties. His reading included a copy of Lavoisier's "Elements of Chemistry," and almost immediately after his acquaintance with this work he began a set of experiments to prove the propositions contained in it; and although his apparatus was very simple, consisting of wine—cups, tobacco—pipes, glass bottles and earthen crucibles, his materials being the mineral acids and other articles in use in medicine, and he was obliged to work at the kitchen fire because he could not afford one in his own room, yet the quality of the work was so fine, and the experiments such a success, that he was encouraged to go on; and from this time he made such rapid progress in his scientific studies that before he was twenty years of age he had propounded certain theories of light and heat which brought him to the notice of other students of science, and which are now considered as embodying the true theory of heat as accepted by modern physicists.

In his twentieth year Davy was appointed superintendent of an institution in Bristol, which had for its object the treatment of disease by different gases. The institution was supported largely by scientific men who wished to find out the remedial qualities of gases, and was furnished with a hospital, laboratory, and

lecture-room. And this appointment proved of the highest service to the young superintendent. Time and the best apparatus were at his disposal, and he could work in the consciousness that he had the intelligent sympathy of some of the first intellects of the day.

He began his work here by the publication of his theories on light and heat, and this was immediately followed by experiments in gases. His first experiment was with nitrous oxide, a gas which was supposed to be harmful to the animal system, and capable of destroying life if inhaled in large quantities. Davy, in the course of his experiments, proved that this view of nitrous oxide was a mistaken one, and found that he could breathe in six quarts of the supposed harmful gas without the least injury, and declared that instead of being a deadly poison, the gas could be used with great benefit by physicians who wished to render patients insensible to pain, nitrous oxide being the first anesthetic ever employed by the medical faculty. The publication of his researches in gases which came out in 1800, excited considerable attention among scientific men, and resulted in his appointment as Professor of Chemistry to the Royal Institution in London, and in 1801, he delivered his first lecture there, which at once made him famous. His lectures were attended by the most celebrated people, and men of science did not more eagerly seek the lecture-room than did the noblemen, and leaders of fashion, who immediately opened their houses to receive such a distinguished guest, and vied with one an- other in bestowing flattering attentions upon him.

But these things were of minor importance to the young chemist, who declared that his life was filled with his work, and that amusements seemed to him only like the dreams which came between his hours of waking. The fine laboratory now at his disposal would have amply compensated him for the loss of popular favor, and from this time his devotion to science was greater than ever, and the next few years were marked by a series of brilliant chemical discoveries, unequalled in the history of any other scientist. These discoveries related chiefly to the connection between chemistry and electricity.

The discovery by Galvani of galvanic electricity, and the investigations of Volta that had led to the construction of the voltaic battery, had given an immense impetus to electrical science; and subsequently the truth of Lavoisier's theory that water was composed of oxygen and hydrogen was proved by the use of the battery in decomposing water into its two elements.

Davy was from the first intensely interested in the subject of applying electricity to chemical experiments, and said that the Voltaic battery was an alarm bell to every scientist in Europe, calling them to new fields of action; and his own great fame rests chiefly upon his chemical researches in connection with electricity.

When water was decomposed by the electric current, it was noticed that the positive and negative poles of the current showed the presence of other

substances than hydrogen and oxygen, and this phenomenon was for many years a great puzzle to scientists, who were forced to the conclusion, that, notwithstanding the fact that they could combine the two gases in such proportions as to make pure water, still there must, in reality, exist other elements in water than they had yet discovered.

Davy believed that the presence of the other substances at the poles of the current was due to impurities in the water, and, after a series of interesting experiments, proved to the entire satisfaction of the scientific world that chemically pure water consists of oxygen and hydrogen alone.

These experiments extended over many years, and were carried on under unusually favorable conditions, as Davy had at his command all the reources of the Royal Institution, which included the largest galvanic battery in the world, and a staff of assistants whose intelligence and fidelity aided greatly in the progress of the work.

The remarkable power of electricity to break up chemical combinations and apparently neutralize the most powerful chemical attractions, as was shown in the decomposition of potash and soda and separation of the metals potassium and sodium, led Davy to the conclusion that chemical affinity and electrical attraction both resulted from the same cause, acting in the one case on the particles of substances and in the other case on their masses.

This theory proved useful in his work, because it suggested a number of experimental inquiries that were fruitful of important results.

Davy also suggested that light, heat, electricity, chemical attraction, and gravitation might all be manifestations of the same power. But this speculation, interesting as it is, reaches out into a region in which darkness and obscurity still reign, in spite of the light of modern science. Yet there is now no doubt but that electricity and light are most intimately connected, and it is more than possible that electricity plays a part in all chemical actions.

In the progress of his work Davy made many experiments of a practical nature in order to put his discoveries to daily use. He visited tanyards to investigate the various processes used, and to try and aid this branch of industry by some suggestions of his own; he also paid great attention to agriculture, which he claimed could be carried on to much better advantage if farmers understood the principles of chemistry, and suggested that much of the sterility observable in mining districts was due to the presence of the poisonous productions from the mines, the refuse of which lay in heaps over the ground, impregnating the streams and making the atmosphere impure.

Davy discovered the metals sodium and potassium, and assisted other scientists in identifying other new elements. His discovery of sodium and potassium is considered his greatest contribution to

chemistry, with the exception of his theory of the connection between electrical and chemical forces.

The wish of Davy to make all his discoveries serve some practical use to man, led him to make one of the most important inventions in the history of physics. From his earliest years he had been acquainted with the dangers and horrors which constantly beset the lives of miners, and his mind had always been drawn to the subject of some means of preventing those terrible explosions, which from time to time caused such sorrow and desolation in every mining district.

These explosions were caused by the inflammable gas, called fire damp, which always accumulates in great quantities in mines, and which is ignited by a lighted candle or lamp. Although fire damp is always present in mines, it is only dangerous when mixed with a certain proportion of common air, and the danger lies in the inability of the miner to detect this condition, in the power of the gas to issue in enormous quantities in a comparatively short space of time, and in a great measure, in the carelessness which characterized that class of men, with whom constant peril had rendered almost indifferent to danger.

In 1815, Davy began a series of chemical experiments to investigate the nature of fire damp, and arrived at these results: that it requires to be mixed with a very large quantity of common air before becoming dangerous, that it requires a greater amount of heat to ignite it than any other gas, that it produces little heat

when burning, and has small power of expansion; he found also, that the mixture of fire damp and air necessary for explosion will not ignite in metal tubes, and that it can be made non—explosive by adding carbon or nitrogen to it.

Mining could not be carried on without the use of lamps, lamps could not burn without air, and air if mixed with fire damp would cause explosions; the problem, therefore, was to invent a lamp which could burn in safety in the presence of fire damp, and this Davy did. He surrounded the flame of the lamp with wire gauze which took the place of metal tubes, in lowering the heat; the gauze allowed the fire damp to rush in and surround the flame which ignited it, but although this happened inside of the wire, so much heat was carried off by the metallic surface, that the temperature outside was not raised to the explosive point before the miner had a chance to escape.

This safety lamp, which is always known by the name of its inventor, has been one of the greatest gifts of science to man, and it has been estimated that it has saved more lives than any other invention, having robbed one of the chief industries of the world of its greatest terror, and brought safety and comfort where before existed danger and ever—present alarm.

In the beginning of his career, while he was yet a boy, roaming about the hills and dells of Cornwall, he had sketched on the cover of a little book which contained his notes, the figure of a lamp encircled with an olive wreath, and this almost prophetic symbol may

well illustrate the motive which prompted all the researches of this great man, that in all the discoveries and achievements of science, the student of nature should but aim at the revelation of truth and the peaceful advancement of the race.

Davy died in Italy in 1829, while traveling for his health. Although only fifty—nine years old he had accomplished as much as is often done in much longer lives, and he will ever be known as the chief of that illustrious band, whose work has marked their era as the golden age of chemistry.