IX. An account of the life and writings of Lavoisier

Jerome Lalande

To cite this article: Jerome Lalande (1801) IX. An account of the life and writings of Lavoisier , Philosophical Magazine Series 1, 9:33, 78-85, DOI: [10.1080/14786440108562671](https://doi.org/10.1080/14786440108562671)

To link to this article: <http://dx.doi.org/10.1080/14786440108562671>

Published online: 18 May 2009.

Submit your article to this journal [↗](#)

Article views: 2

View related articles [↗](#)

4. The two kings grant a freedom of trade reciprocally to the people of both nations.

“Peace being thus established, the two kings behaved very friendly towards each other, smoked tobacco together, conversing on indifferent subjects, and thought no more of the unfortunate wretches who during this campaign had been taken prisoners, and, of course, sent into slavery; they remaining in the power of those by whom they had been captured. This war had cost on either side about a thousand men, several villages and towns being laid waste, and some thousands of inhabitants deprived of their habitations and property. On the 20th of August the treaty was ratified, and on the 28th we returned to the king in the capital.

[To be continued.]

IX. *An Account of the Life and Writings of LAVOISIER.*
By JEROME LALANDE.

ANTHONY LAURENCE LAVOISIER was born at Paris on the 26th of August 1743, and enjoyed the advantage of a good education, on which his father, a man of property, bestowed great care. In the year 1764, the French government having proposed as the subject of a prize of 2000 livres the best method of lighting the streets, the prize was divided among three artists who had made experiments on the subject; but Lavoisier, who had examined it as a philosopher and man of letters, was rewarded in a different manner. The paper which he wrote in answer to this question was published at the expence of the Academy of Sciences, and the King caused a gold medal to be presented to him by the president in a public sitting of the academy held on the 9th of April 1766. This paper, which contained a great many excellent mathematical and philosophical observations, announced the author's entrance in the career of science in which he afterwards continued to distinguish himself.

On the 18th of May 1768, he was chosen a member of the academy, in the room of Baron; and about the same period he published several treatises in different periodical publications,

tions, such as Observations on the proposal for erecting a steam engine to supply the city of Paris with water, on thunder, on the northern lights, on the transition of water into ice, &c. The Memoirs of the Academy for the year 1770 contain Observations by him on the nature of water, and on the experiments said to prove the possibility of its conversion into earth. Lavoisier, however, showed that the earth obtained by the distillation of water was a part of the vessel which had been attacked during the operation: for, having continued the distillation without interruption 101 days, the total weight of the vessel and of the water contained in it remained unchanged, but the pelican had lost as much in weight as the water had increased.

In the year 1774 Lavoisier proved that the increased weight of metals during their oxidation, arose from their imbibing the air contained in the vessels in which the operation was performed; by which means a question that had long formed a subject of dispute among philosophers and chemists, and had occasioned many costly experiments, was finally determined. This formed a foundation for his new chemical theory, which he first opposed to the phlogistic system before adopted by chemists.

In the same year he published his small physico-chemical works. Priestley, in the year 1772, had made known his experiments on carbonic acid gas; but Lavoisier traced back its origin to Paracelsus, born in 1493, and to his pupil Van Helmont, born in 1588; and showed that even Palissiey, Ray, Boyle, Hales, Venel and Macbride had been in part acquainted with this gas. He showed also that Dr. Black of Edinburgh had called the attention of philosophers to this important part of chemistry so early as the year 1756*; and therefore he ascribed to him the honour of this new discovery, which in the course of twenty years had given occasion to so many others of the utmost importance to mankind.

Lavoisier proved by his experiments, that an elastic fluid, or kind of gas, was united in a fixed form with calcareous earth; he proved the presence of it in alkalies, and showed

* In *Essays and Observations Physical and Literary*, Vol. II. Edinburgh 1756.

that it was produced during the reduction of metallic calces and of the phosphoric acid. He not only applied to chemistry the different methods of experimental philosophy, and its various kinds of apparatus, but even introduced into it the spirit of accuracy and calculation, which had never before been employed in that way. With this union of two branches of natural knowledge, Lavoisier's principal work forms the commencement of a bright period in the history of their improvement.

Priestley having found that, during the union of nitrous acid with an earth, oxygen gas was generally produced, thence concluded that atmospheric air was a mixture of nitrous acid and earth. Lavoisier, on the contrary, showed in the year 1776, that oxygen gas was a component part of nitrous acid. This observation confirmed the truth of a great number of experiments, and gave rise to a variety of other discoveries.

In the year 1778 he was able to prove that the purest air, that necessary for respiration, or the dephlogisticated air of Priestley, was the cause of acidity, and existed in all acids. To this part of the atmosphere, contained in all acids, which converts the metals into metallic calces, and creates oxygen gas in union with caloric, he gave the name of *oxygen*.

In Germany, where chemistry has been much cultivated, this theory was soon adopted, and first made known by Girtanner at Gottingen, and Hermbstadt at Berlin, the latter of whom translated Lavoisier's *Elementary Treatise of Chemistry* into German. Soon after it was adopted also by Klaproth, Mayer, Lichtenberg, and Götting. Weftrumb, Crell, and Gren, however, still endeavoured to defend the old phlogistic system; but the majority was against them. Berthollet remained for some time undecided; but his own experiments soon induced him to embrace this theory, which conducted him to important discoveries.

In the month of June 1783, Lavoisier constructed an apparatus for burning hydrogen gas with oxygen gas in close vessels; and the result was a fluid, or rather pure water, the weight of which corresponded exactly with that of the two gases employed. Having learned that the same experiment had been made by Cavendish and Monge, he invented an-

other apparatus for decomposing water, with which, by means of iron tubes, he separated the hydrogen from the oxygen. Lavoisier proved also that atmospheric air consists of two kinds of gas, one of which is fit, and the other unfit, for respiration; that the first is oxygen, which possesses the property of uniting with bodies, and thereby becoming fixed; that this substance combines with metals during their oxidation, and with combustible bodies when in a state of combustion; and that in the first case a metallic calx is produced, and in the last an acid, which is of a different nature according to the kind of the inflammable body. On this depends the whole theory of combustion, of the production of acids, and the division of natural bodies into inflammable and non-inflammable. On this depends also the knowledge of that kind of gas called formerly fixed air, but now carbonic acid gas, because it is produced during the combustion of charcoal, and is compounded of carbon and oxygen.

Lavoisier, therefore, was the first who discovered that the different kinds of gas are the result of the solution of any substance by caloric; this conducted him to the conclusion that the caloric and the matter of light, disengaged during the combustion of inflammable substances, does not arise from them, but from the air which surrounds them, and in which the combustion takes place. In this series of experiments may be classed that made by Lavoisier on detonation, which is nothing else than a sudden inflammation, the products of which are disengaged in the gaseous form.

In the year 1776, Lavoisier by means of Turgot was appointed superintendant of the powder manufactory, in order to improve that art; and this he did so effectually, that the powder manufactured under his inspection was capable of driving a musket-ball to the distance of 120 fathoms, whereas that made before was capable of driving it only to the distance of 90 fathoms. In the war of 1765, the English bullets reached our vessels from a distance at which ours could not reach them; but in the war of 1778 the case was reversed. In the year 1788 he was in great danger of losing his life in consequence of an explosion which took place during some experiments then made at Essone.

All these experiments conducted him to a complete analysis of nitrous acid, an acid easy to be decomposed, but difficult to be extricated; and which, however, is of great importance, as it is a component part of saltpetre, and at the same time of gunpowder.

In the year 1789, Lavoisier endeavoured to bring the whole series of his experiments into systematic order, and thence to compose an elementary work on chemistry. Two editions of this work were sold off in the author's lifetime, and he had begun to prepare a new and improved one, in which new light would have been thrown on the whole science of chemistry. He intended also to give a collection of all his *Essays* in six volumes, but of these three only were published.

It would be difficult to determine what influence Lavoisier's discoveries have had, or may in future have, on the practice of the arts; but, if we consider the entire revolution effected in that of dyeing by the new chemistry, we shall find reason to entertain the best hopes respecting the rest. Almost all the phenomena in this art may now be traced back to burning and combustion, as has been sufficiently proved by Berthollet in his important work on dyeing. This art, therefore, which formerly depended on mere practice, is now founded upon a very simple and well-grounded theory.

The art of mining, of assaying and fusing metals, of preparing steel, of bleaching linen and wax; in a word, almost all the chemical arts, under the direction of the new theory have been rapidly improved and brought near to perfection.

By applying these discoveries to the phenomena of breathing, Lavoisier has shown that this vital function is a real combustion of carbon and hydrogen, by which carbonic acid and water are produced. The effect of this combustion is animal heat, the degree of which he was so fortunate as to ascertain by calculation. His experiments on this subject conducted him to means for determining the remarkable relation which exists between accelerated respiration, the circulation of the blood, and perspiration, and between the different powers, and the application made of them by nature. He had laboured also for a long time on a particular work on the subject of digestion.

The

The last, and perhaps the most important of Lavoisier's labours related to animal perspiration, on which subject he read a paper before the Academy of Sciences on the 4th of May 1791. A part of this paper may be found in the *Memoirs of the Academy* for the year 1790.

Lavoisier first lays it down as an established principle, that the animal body is maintained by respiration, perspiration, and digestion. He then examines in a chemical view each of these effects, the nature of the perspiration of the skin and of the lungs, distinguishes the effects from each other, and, as it were, interrogates nature respecting the three causes by which they are produced. He invented an apparatus by which every thing that relates to evaporation externally, and to breathing internally, could be observed. In conjunction with Seguin, he made on this subject some exceedingly difficult and laborious experiments, by which he found that a man by perspiration loses daily 2 pounds 13 ounces; that in the course of 24 hours he consumes 33 ounces of oxygen gas; that in the same period 8 cubic feet of carbonic acid gas, one third of which consists of carbon, and two thirds of oxygen, are disengaged from the lungs; that the quantity of water produced in the lungs amounts to 1 pound 7 ounces, of which 3 ounces are hydrogen, and 20 oxygen, and that only 6 ounces of water are formed by the perspiration of the lungs. For these experiments he had provided balances which did not err half a dram in 125 pounds.

By these accurate and difficult experiments Lavoisier had obtained great insight into the causes of several diseases, as well as in regard to the means of assisting the powers of nature in curing them, and on that account had resolved to overturn the immense colossus of medical prejudices and errors which had been before established. None of his undertakings was of more importance than this, and it is much to be lamented that he did not live to carry it into execution.

Between the years 1778 and 1785, he improved and cultivated at his own expense 240 acres of land in la Vendée, in order that he might promote agriculture by setting a good example before the farmers; and his mode of culture was attended with so much success, that he obtained a third more

of crop than was obtained by the usual method. In the course of nine years his produce was doubled; but as the capital he laid out did not produce him five per cent., he was thence induced to form a plan for lowering the interest of capitals, and extending leases to the period of 27 years.

The committee of the constituent assembly of 1791, appointed for the purpose of settling the taxes, having requested Lavoisier to assist them by his knowledge in accomplishing the object which they had in view, his ideas were of great assistance to them in the formation of a plan by which the whole system of income and expenditure was greatly simplified. In order that he might give the committee the necessary information on this subject, he communicated to them an extract from a very large work on the different productions of the country, and their consumption, for which he had been long employed in collecting materials. This extract was printed by the National Assembly, under the title of *Richesses territoriales de la France*, and is undoubtedly the best work on the subject.

In the year 1791 he was appointed a commissioner of the national treasury; and, without abandoning the study of the sciences, he introduced into this department such order and regularity, that the proportion between the income and the expenditure in all the branches of government could be seen at one view every evening.

In the great and important undertaking of establishing in France a new system of weights and measures, with which the academy had been occupied for some time, none of the members was more active or more useful than Lavoisier.

In order that he might diffuse new light on the important but not sufficiently illustrated doctrine of the expansion of metals by heat, he constructed an apparatus by which metal rods immersed in water and exposed to different degrees of heat, put in motion a telescope, which showed on a distant object the smallest degree of expansion.

In the year 1793, it being necessary to have a basis measured with the greatest accuracy, in order to determine the length of an arc of the meridian, he erected in his garden rods of platina and copper, which he employed as metallic
thermometers,

thermometers, and on which each degree of variation in the temperature could be accurately observed. On this occasion he ascertained the proportions of their expansion, and these rods were afterwards employed in measuring a base between Lieufaint and Melun; from which were afterwards deduced the length of the meridian between Dunkirk and Barcelona, the circumference of the earth, and the standard for the new French measures.

It might have been expected that a philosopher possessed of talents so rare and uncommon, would have inspired with respect for his character the most savage and worthless of mankind. But at that period the helm of the French government was in the hands of a set of monsters to whom nothing was sacred, and whose unbounded ambition sacrificed every thing to the hope of flattering the deluded populace. They conceived that nothing could contribute more to the accomplishment of this view, than to offer up as victims at the shrine of popular licentiousness all the farmers-general; and in consequence of this cruel measure, twenty-eight of them, among whom was Lavoisier, were put to death, for crimes real or pretended, on the 8th of May 1794, by the bloody revolutionary tribunal.

In the year 1771, Lavoisier married Mary Anne Pierette Paulze, the daughter of one of the farmers-general, a lady of agreeable manners, and possessed of considerable talents. She engraved the copper-plates for his last work.

Lavoisier was of large stature; complacency and penetration were displayed in his countenance; his behaviour was mild, civil, and polite; and his activity knew no bounds.

X. *Proceedings of Learned Societies, Miscellaneous Articles, and new Publications. Feb. 1801.*

ROYAL SOCIETY OF LONDON.

JAN. 29. A paper on a most remarkable lusus of a sheep, by Anthony Carlisle, Esq. was read. Also an anatomical paper on a Rhinoceros, by Mr. Leigh Thomas.

On