

TIME TRAVEL

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Diamonds Are (Not) Forever*

The RF and microwave community is well acquainted with the work of Michael Faraday (1791-1867) on electricity and magnetism and, most famously, with his discovery of induction in 1831. It is less well known, however, that he also contributed to chemistry, a field that was his first interest. Notably, in his late years, he gave a series of elementary lectures still enchanting today.¹ These became renowned as the "Christmas Lectures," very appropriate for Londoners' eagerness to learn about applied science when popular scientific outreach did not yet exist.

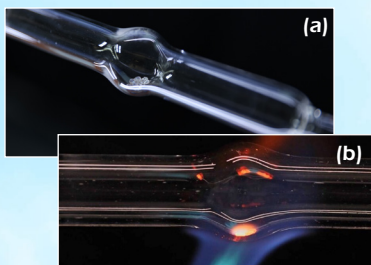
In his early years, Faraday attracted the attention of Sir Humphry Davy (1778-1829), the famous chemist and director of the Royal Institution, which supported carrying out public scientific experiments. Davy chose Faraday as an assistant in 1813, and in the same year, a 22-year-old Faraday left England with Davy, enrolled both as an assistant and a valet for a "Grand Tour" in Europe, which eventually lasted to 1815.²

In Florence, Faraday and Davy used a large lens pair, the "Bregans lenses," owned by the Grand Duke of Tuscany and currently exhibited at the Science Museum in Florence,³ to set up an experiment. In the experiment, a diamond was stored in a glass enclosure with pure oxygen and ignited via concentrated solar rays. No ashes were left, and among the gases, only carbon dioxide was present, proving that no other elements were present in the diamond.

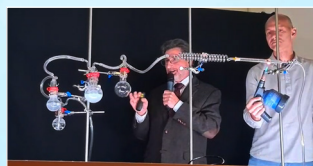
Scientists long knew diamonds could be burned; that same lens had been used by two Florentine experimentalists, Averani and Targioni, from 1694 to 1695, trying to burn various gemstones. They burned diamonds but could not determine their composition. In contrast, Davy's careful setup proved the composition, and a young Faraday learned in his youth from Davy how to devise accurate and inarguable experiments. He then mastered this art and became one of the greatest experimental physicists in the following years.

On November 14, 2025, to celebrate the two hundredth anniversary of Faraday's visit to Florence, the experiment was repeated in Florence in front of a vast audience in the chemistry laboratories of the National Research Council.

This modern-day celebration of fundamental scientific discoveries reminds us that RF and microwave technology is not a standalone field, but a convergence of applications of foundational scientific principles.



(a) The diamond fragments in the quartz tube and (b) the same fragments glowing, in a flux of pure oxygen, as they are almost completely combusted.



The gas, flowing from right to left in the image, reacts with the heated diamonds and the resulting carbon dioxide is revealed by reaction with the barium hydroxide in the two middle flasks.

References

- *Read the title on the notes "Diamonds are Forever," 1971, music: John Barry, lyrics: Don Black, voice: Shirley Bassey
1. M. Faraday, *Chemical History of a Candle*, London: Griffin, Bohn & Co., 1861.
2. G. Pelosi and S. Selleri, "Michael Faraday and James Clerk Maxwell: The Florentine days," *Il Colle di Galileo*, 9(2), 2020, pp. 27-37, Online DOI: 10.36253/cdg-12062.
3. "Chemical "Affinities," Museo Galileo - Institute and Museum of the History of Science, <https://catalogo.museogalileo.it/oggetto/Lente.html>.