

# Encounters with Chemistry

# Herbert Spencer

William B. Jensen

Department of Chemistry, University of Cincinnati  
Cincinnati, OH 53706

*Many famous nonchemists have left behind accounts of their first encounter with chemistry. Whether the person in question was a psychologist, a writer, a critic, an artist, an economist, a mathematician, or a philosopher, whether the experience was brief or prolonged, whether it was pleasant or unpleasant, the purpose of this series is to record these encounters and do so in the person's own words whenever possible.*

**Herbert Spencer** (figure 1) was arguably the best known and most widely discussed British philosopher of his day. A self-taught nonacademic, he became the chief spokesman for the principle of evolution, which he attempted to apply not only to biological systems, but to astronomical, geological, psychological, social, and ethical systems as well. His magnum opus, *The Synthetic Philosophy*, which was intended to delineate his evolutionary world view, eventually occupied 14 volumes and took more than 34 years (1862-1896) to complete.

In politics Spencer was what would now be called a libertarian, a view which colored much of his writing. Though in his day he exercised a substantial influence on the fields of population ecology, sociology and anthropology, he lived to see much of his work rejected by the newer generation, which held different political views and which eventually succeeded in recasting him (rather unfairly) as the chief villain of Social Darwinism.

The son of a school teacher, Spencer recounted in his autobiography that his first acquaintance with chemistry was an indirect result of having to assist his father in teaching science:<sup>1</sup>

*My father had an electrical machine and an air-pump; and from time to time classes of his pupils came to see pneumatic and electric phenomena. I had frequently to make preparations for the experiments and to aid in performance of them. The result was that being on many occasions witness to the facts, and hearing the explanations given, I early gained some knowledge of physics. Incidentally, too, I was led into chemistry. One of my duties in preparing for these lectures was to fill an electrical pistol.<sup>2</sup> The required process had its sequence; for from the solution of sulphate of iron formed in the act of obtaining hydrogen from iron fil-*

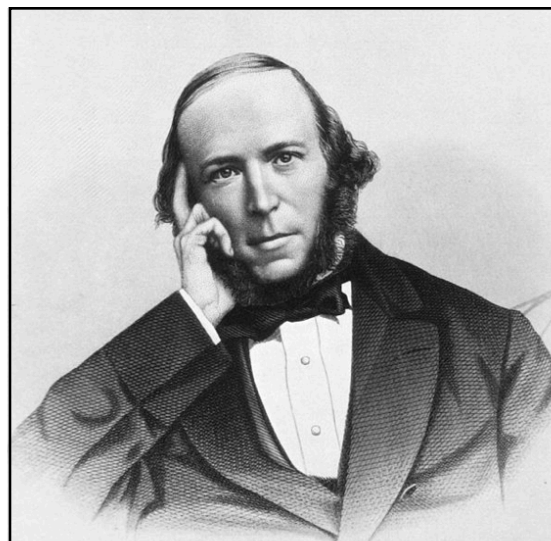


Figure 1. Herbert Spencer  
(1820-1903)

*ings, I was in the habit of producing afterwards the crystals of that salt. These by their beauty were attractive; and I sometimes repeated the experiment from mere love of seeing the result. This led the way to crystallizations of other salts, and eventually to other chemical experiments. Much damage was done by letting fall drops of acid upon my clothes; and occasionally the furniture was somewhat the worse in consequence of my awkwardness. But, as my father well knew, these were small evils compared with the value of the knowledge gathered and the faculty of manipulation acquired; and he would not have my doings interdicted. Little by little I became much interested in chemistry at large, and read with interest a small book by an itinerant lecturer named Murray, who at that time occasionally came to Derby – a very incompetent man, but one who served to make familiar the simpler experiments ...*

*I say he was incompetent; being led to say so partly by an anecdote my father told respecting him. On one occasion, when lecturing before the Philosophical Society of Derby, he exhibited the properties of the then-recently-discovered chloride of nitrogen, or, as it was then called, the “detonating oil of M. Du-*

long.” After expatiating upon its terrific force, he was about to explode a drop placed in a saucer upon a chair, when some member of the society interposed with the suggestion that if its force was so great it might probably damage the chair. To which Mr. Murray rejoined that there was no such danger, since it was a remarkable peculiarity of the compound that it expended all of its force upwards. Whereupon he proceeded with the experiment and the explosion blew the chair-bottom out.

The itinerant lecturer referred to in this account was probably John Murray (1785-1851) and the book that Spencer read was probably Murray’s *A Manual of Experiments Illustrative of Chemical Science*, which passed through at least four editions between 1828 and 1834.<sup>3</sup> As for the “detonating oil of M. Dulong,” this refers to the discovery in 1811 of the compound nitrogen trichloride by the French chemist, Pierre Louis Dulong (figure 2), best known as the codiscoverer, along with Alexis Therese Petit (1791-1820), of the law of constant atomic heats. As suggested by Spencer’s anecdote, this is a violently explosive compound and, as result of an explosion while experimenting with it, Dulong lost both an eye and two fingers.

The necessary precautions when preparing this substance were summarized in the 1858 edition of David Wells’s *Principles and Applications of Chemistry*:<sup>4</sup>

*When a bottle of chlorine, perfectly free from greasy matter, is inverted over a leaden dish containing a solution of 1 part sal ammoniac ( $\text{NH}_4\text{Cl}$ ) in 12 parts of water – the mouth of the bottle dipping slightly beneath the surface – drops of an oily-looking substance will gradually form upon the liquid and fall to the bottom of the dish – the chlorine gradually disappearing. The fluid substance thus generated is chloride of nitrogen. During the whole operation, the bottle must not be approached, unless the face is protected by a wire-gauze mask, and the hands by thick woolen gloves. The leaden dish containing the chloride of nitrogen may, after a while, be withdrawn from under the bottle, care being taken to avoid all agitation and contact with the glass.*

*As thus prepared, it is a volatile, oily liquid with a peculiar, penetrating odor. When heated to about 200°F, or when merely touched with a greasy substance, with phosphorus or an alkali, or even when subjected to the slightest friction or jarring, it explodes with a flash of light and a violence that is difficult to conceive of. Glass and cast iron in proximity to it are*



Figure 2. Pierre Louis Dulong  
(1785-1838)

*shattered into fragments, and a single drop has been known to cause a perforation through a thick plank.*

Compared to a thick plank, Murray’s chair bottom obviously did not stand a chance.

### References and Notes

1. H. Spencer, *An Autobiography*, Vol. 1, Appleton: New York, NY, 1904, pp. 97-98.
2. A glass pistol is a small glass vessel in the shape of a gun in which a brass rod takes the place of the hammer and whose barrel is plugged by a cork. Before corking, it was filled with a mixture of hydrogen and either air or oxygen. It was usually detonated by means of a spark from a Leyden jar.
3. The original identification of John Murray has been corrected based on information provided by Professor John Shorter of the University of Hull.
4. D. Wells, *Principles and Applications of Chemistry*, Iviston & Phinney: New York, NY, 1858, pp. 248-249.

### Publication History

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