Ken A. Woolner, Waterloo ON (1934-2008)

One of the most memorable articles we ever carried in *Chem 13 News* was Ken Woolner's short biography of Claude Émile Jean-Baptiste Litre. We reprint it here, complete with introduction, illustrations and final Editors' note as it appeared in our April 1978 issue. Be sure to read Ken's follow-up article, *The Litre Story.* Ken calls himself a physicist but revels (some would say, mucks about) in science history. We are also informed that Ken's grandfather, who loved to pull off public spoofs, was the cause of the phrase (now corrupted), "to pull the Woolner" over someone's eyes.

Claude Émile Jean-Baptiste Litre (1716 – 1778)

reprinted from Chem 13 News*, pages 1-3, April 1978*

(In celebration of the 200th anniversary of the death of this great investigator, the Conférence Générale des Poids et Mesures has decided to use his name for the SI unit of volume. The official abbreviation will be L, *following the standard prescription of using capital letters for units named for individuals.)*

Claude Émile Jean-Baptiste Litre was born on February 12, 1716, in the village of Margaux in the heart of the Médoc region of France. His father was a manufacturer of wine-bottles, as had been his grandfather and great-grandfather. Indeed, Litre bottles had been a vital adjunct of the Bordeaux wine industry since the 1620s. This family tradition of concern for the problems of liquid containment, and knowledge of the properties of glass, was undoubtedly a major influence upon Litre's later work on the measurement of volume.

By the age of 16, Litre had demonstrated a budding mathematical talent, and he was sent to Paris to study with Pierre de Maupertuis (1698 – 1759), who became his scientific mentor.

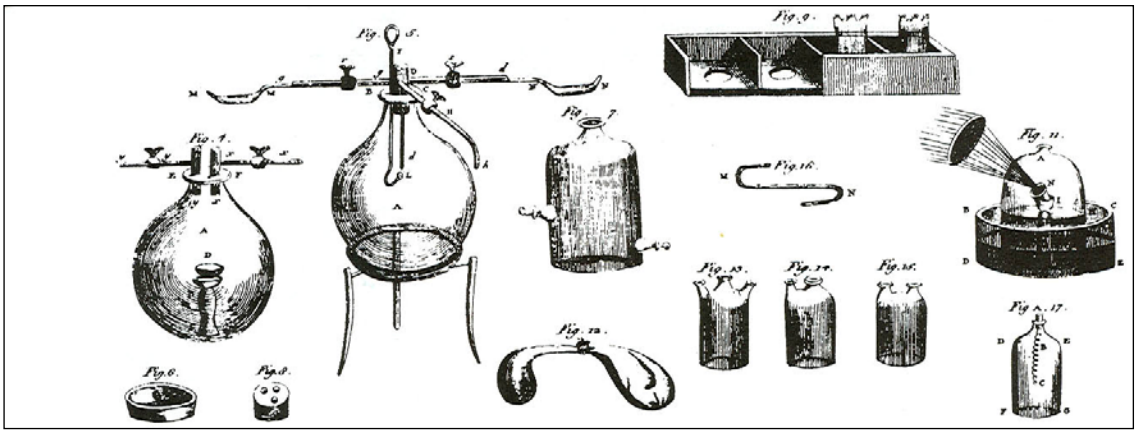
The most important scientific controversy of the 1730s concerned the correctness of the Newtonian theory of the Earth. According to Newton (1642 – 1727), the figure of the Earth should be an oblate spheroid, bulging at the equator and flattened at the poles, this shape being a centrifugal effect of the Earth's rotation. The Académie des Sciences decided to test the theory by measuring the curvatures of the Earth's surface at the equator and in the far north. Accordingly, in 1735 the great geographer La Condamine (1701 – 1774) led a surveying expedition to Peru, and in 1736 Maupertuis mounted a similar expedition to Swedish Lapland. The young Litre was invited to join the expedition as Maupertuis' assistant.

In Sweden, the liaison between the French party and Swedish officialdom was handled by Anders Celsius (1701 – 1744), the professor of astronomy at the University of Uppsala. Celsius traveled to Lapland with the expedition as the official representative of the Royal Swedish Academy, and during the summer of 1736, Litre and Celsius became firm friends. There is no doubt that Celsius' preoccupation with precise measurement, and his dedication to the centigrade division of measured quantities, had a profound influence on Litre's later decision to pursue a career as a scientific instrument-maker.

The only extant, authenticated portrait of Litre. Artist and date unknown.

The next 15 years of Litre's life are shrouded in mystery. Presumably he returned to Paris after the successful completion of the expedition, and it is generally believed that he established his instrument-making business in 1740. But very little hard information is available. There is one unsubstantiated report that he visited New France and attempted to repeat the Lapland measurements, and another account that has him back in Bordeaux, perfecting his glass-making techniques! The paucity of information on this period of Litre's life, and the wide divergences and inconsistencies between the few "facts" that are available, has proved very frustrating for historians of the period. If any reader of *Chem 13 News* has good information to offer, the editors would be delighted to receive it.

There is, however, no doubt at all that by 1751 Litre was very well established. In September of that year Guillaume Rouelle (1703 – 1770), the famous demonstrator in chemistry at the Jardin du Roi, gave a public lecture on *Les Méthodes de Chimie* which was nothing less than a detailed demonstration of Litre's chemical glassware. By the end of the year Litre's business had quadrupled! Over the course of the 1750s, Litre completely outstripped his competitors, and owned a virtual monopoly on all chemical apparatus. Through the '60s and early '70s, Litre's laboratory equipment became a tradition in France, and perhaps contributed as much to "La Révolution Chymique" as did Lavoisier (1743 – 1794) himself.

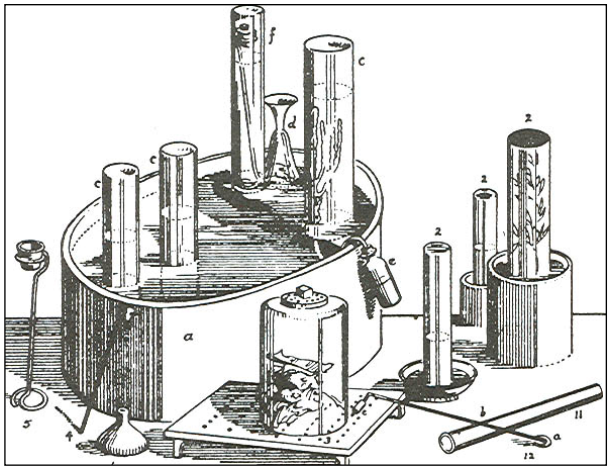


Part of Lavoisier's apparatus, from the Traité élémentaire de Chimie, *1789. The vessel of Fig. 15 (star) is thought to have been made by Litre.*

Not that Litre may be compared to Lavoisier as a chemist — indeed Litre always claimed to be completely ignorant of the subject! But he was much more than a very successful businessman. By the time he was 40, he had made his fortune, and he left the running of his business to others, while he devoted himself to what has proved to be his lasting claim to fame — the accurate measurement of volume.

Before Litre, no one had ever made an accurate cylinder of clear glass, and yet his cylinders varied in internal diameter by less than 0.1% over their whole length. And no one, before Litre, had so precisely graduated a cylinder of glass — into tenths, hundredths, and sometimes even thousandths! His graduated cylinders, and his burettes (he invented the device, and its name) were coveted by chemists all over Europe.

His major written work, the *Études Volumétriques* of 1763, was translated into English in 1764 by Joseph Priestley (1733 – 1804), and into German in 1767 by Karl Wilhelm Scheele (1742 – 1786). In the preface to his translation, Priestley praised Litre's work as a consummate example of the fact that, "…all things (and particularly whatever depends upon science) have of late years been in a quicker progress towards perfection than ever."



Part of Priestley's apparatus, from his Experiments and Observations on Different Kinds of Air, *1774. The cylindrical vessel 11 is believed to have been a Litre cylinder.*

Litre visited England in 1765 to receive a special gold medal struck in his honour by the Royal Society. In return, he donated to the Society a set of his graduated cylinders. Unfortunately these cylinders did not survive the experiments of Sir Humphry Davy (1778 – 1829), who made nitrogen trichloride in them in 1812.

Litre's later years were spent basking in the fame and adulation heaped upon him by the savants of Paris, and spiced by an unending sequence of patent litigations against German, Venetian, and Bohemian glass-makers. Although he was the recipient of every civil honour that France could bestow, Litre was never admitted to the Académie des Sciences, even though he made apparatus for all the Académiciens, and was regarded as a friend by many of them. It is rumoured that Litre was kept out by the politicking of Lavoisier, who did not want the aristocratic atmosphere defiled by a "fournisseur". Litre refused to allow himself to be upset by this lack of official recognition by the scientific establishment. Indeed, it seems that Litre never allowed himself to be upset by anything — he was a patient, phlegmatic individual, not given to argumentation. He was abstemious, hard-working and in the best of health when he was cut down prematurely on August 5, 1778, during the cholera epidemic of that year.

In his *Études Volumétriques* Litre had chosen, for his standard volume, a measure very close to the old *flaçon royal* of Henri IV, introduced in 1595 to standardize the taxation of wine. However, he recognized the arbitrariness of this unit, and suggested that in any rationalized system of units, volume could be specified in terms of a standard mass of a standard liquid. He suggested mercury. But Litre's dream of a rationalized system of units did not start to materialize until 15 years after his death, when the mathematician Lagrange (1736 – 1813) was appointed to head a commission to draw up such a system. And in 1795 the metric system was born.

Litre's method of specifying volume was adopted, although the commission decided to use distilled water rather than mercury as the standard liquid. The chemist Antoine de Fourcroy (1755 – 1809), who had studied instrument-making in Litre's factory before his great work on nomenclature with Lavoisier, was apparently the first to suggest that Litre's name be used for the unit of volume.

Editors' note: Ken Woolner tells us that the details of Litre's life are very hard to establish, and most of this account was inferred from the general literature of the period. Apparently Litre did not keep a journal, the correspondence with Celsius has been lost, and of course chemical glassware does not last, so there are no extant examples of Litre's skill. Perhaps our readers can help to flesh out this sketch.)

THE LITRE STORY

Reprinted from* Chem 13 News*, pages 45-46, September 1978

Claude Émile Jean-Baptiste Litre was born during a crippling blizzard, in a hotel room in Ottawa, in December of 1977. Reg Friesen and I were there on an expedition to visit a few high schools, hoping to find out why their students seemed to perform much better than the average on UW's prize exams, the CHEM 13 NEWS Exam and the SIN Test. Not that we found out anything of the sort, of course, but we were well received, and enjoyed our visits immensely, especially at the school where we had the salutary experience of taking over the morning classes of teachers who were snowed in at home.

The idea for Litre came from Reg, who told me that a group of U.S. chemists (I believe) had proposed that the common abbreviation for the unit of volume should be changed to "L", on the grounds that the "ℓ" then in use was confusing for both readers and typists. But the rules of nomenclature of the Conférence Générale des Poids et Mesures require that upper-case letters be reserved for units which are named for individual scientists, and since no such person existed for "L", it seemed reasonable that one should be invented. Reg suggested that I should write a "biography" for the April issue of *Chem 13 News*, and over the course of an evening (which included, I think I recall, most of a bottle of scotch) we generated much of the substance of an 18th century life, full of drama, revolution and romance.

When I actually sat down to write the article (a month or so later, after quite a few reminders from Reg), I realized that drama, revolution and romance were all very good, but the joke would be better if the article came across as a piece of sober historical research. The idea was to give a straightforward account with correct dates and accurate historical details, but with one person added to the great stream of history. So that's how I wrote it, and I thought it came out very well. Given the possibility that some readers might miss the joke simply by not recognizing the significance of the fact that the article appeared in the April issue of the magazine, I made sure that the captions to the illustrations were obviously funny, and I left a 15-year gap in Litre's life so that others could contribute to the story.

The immediate response to the article made me feel very good indeed. Several readers went along with the game, filling in some of my missing details, particularly on the life of Litre's daughter Millie. I also found that I had been "scooped" by Bruce Dodd of the Canadian Government Specifications Board, who had published a "Research Note" on Marco Guiseppe Litroni in the June 1977 issue of *Standard Engineering.* The link between LItroni and Litre was provided in 1979 by Steve Marriott of the British Standards Institution, who speculated that the name "Litre" was adopted by Litroni when he settled in France after a mafia-induced flight from his native Tuscany! The best pseudo-historical contributions came from T.J. Kukkamäki of the Helsinki Geodetic Institute, (a genuine expert on Maupertuis' expedition to Lapland), who provided detailed evidence to show that Litre had stayed on in Sweden after the rest of Maupertuis' party had returned to France in 1737. In September 1979, the article was reprinted in IUPAC's *International Newsletter on Chemical Education.* Editor D.J. Waddington received some further contributions to the Litre story, which he shared with us. It was clear that a great deal of innocent pleasure was being had by one and all. My article was a success.

There is a special corner of Hell reserved for failed humorists, and the first indication that a place was being prepared for me came as early as November 1978, when a college librarian wrote from California requesting "…any information and sources you have used in the preparation of this most interesting article." A rash of similar requests was triggered by the *International Newsletter* version of the article, which had all my words but had omitted the illustrations and their captions, which didn't fit into the newsletter's format. The Big Event which turned my "spoof" into a "literary hoax" came in January 1980, when a précis of the article appeared in *Chemistry International*, another IUPAC newsletter. This rewrite was based on the *International Newsletter* version of the article, and stripped the thing right down to the essentials of Litre's life, leaving a very good piece of reportage marred only by the fact that the writer actually took the original seriously!

Unfortunately, it was the *Chemistry International* version which seems to have been most widely read, and this was the version which, together with the editor's apology for not recognizing the hoax, made it into Robert Weber's *More Random Walks in Science.* The *Chemistry International* version got Litre on to the radio, on the Canadian Broadcasting Corporation's science magazine show, *Quirks and Quarks.* It was also the version that the editors of *The New York Times* so roundly castigated as they indignantly "put the deception to rest"!

All things considered, the creation of Litre provided me with a great deal of amusement for a number of years, and didn't do any real harm, although I did hear that he'd made it into a textbook! My only regret is that it seems that one should only ever write one fictional biography. (Even Rayburne, the only classic exponent of the genre, was never able to repeat the success of his full-length biography of Thos. Crapper.) Which is a shame, since in the course of writing the Litre piece, I thought of several individuals who really should have some sort of biographical memorial. (It's very hard to stop, once you've started!) As my one personal contribution to this special issue of *Chem 13 News* and its readers, I offer the following capsule sketches, upon which you might like to expand.

Rodrigues d'Ombreija – Sixteenth-century Portuguese navigator who brought the parasol from China.

Thomas Flange – Foreman in Stephenson's factory, whose invention made it possible for us to have railways rather than grooveways.

Sir Horace Rajendra Bungaloo – Knighted by Queen Victoria for his contributions to domestic architecture.

Bratislav Parseč – Turn-of-the-century director of the Prague Observatory.

REQUIESCAT IN PACE

The man who lies here, deceased,
Was trained as a Catholic priest.
With help from St. Peter
He invented the litre,
That infamous Claude Jean-Baptiste.

(Found engraved on a tombstone in a Waterloo cemetery by Gerry Toogood of UW's Chemistry Department. Apparently, Litre's body was among those sent overseas for burial when the 1778 cholera epidemic produced more victims than French cemeteries could handle. Note the new evidence that Litre studied theology, possibly during the "15-year gap" from 1736 to 1751.) ■

Ordering deadline approaches!

- CHEM 13 NEWS Exam — April 15, 2009
- AVOGADRO Exam — April 22, 2009

(Late orders will not be accepted)

Cost is $**2.50 per exam** (minimum order is 5 copies, $12.50) **plus** courier/postal cost of $10.00 per school in Canada, CAN$15.00 outside Canada.

Recent exams are at: *www.chem13newsexam.uwaterloo.ca*
www.avogadroexam.uwaterloo.ca
For order forms/information: kjackson@uwaterloo.ca
Tel: 519-888-4567, ext 32505; Fax: 519-888-9168

ChemEd 09 — Highlight

Francis Webster will demonstrate the "Magic of Chemistry" on August 2. Francis has given more than 150 invited presentations to local schools with the involvement of more than 50 Radford University students. These shows have reached approximately 13,000 teachers and students.

Students shine growing crystals

Copper II sulphate was the chemical chosen for the 2008 National Crystal Growing Competition, carried out by the Chemical Institute of Canada, as part of National Chemistry Week (NCW). Students from high schools and those who are home schooled across the country were invited to try their skill at growing the largest, best quality single crystal. Prizes were awarded to the top three schools in the Best Overall category, one prize for the Best Quality crystal and one prize for the Best Crystal from a Teacher. Congratulations to the winners.

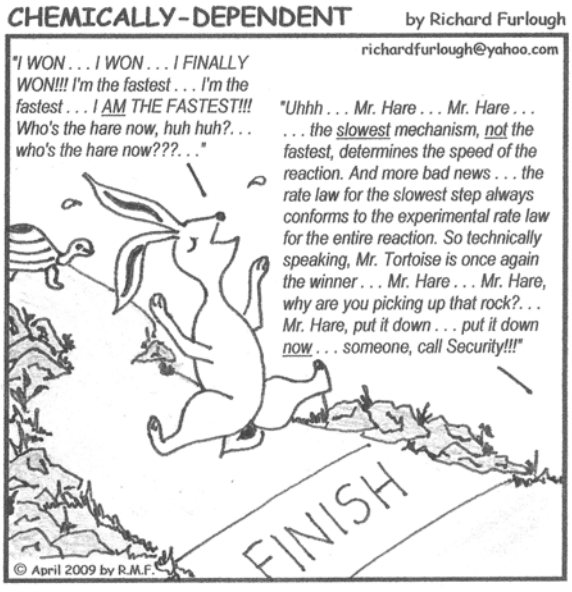
See back cover for photos of the winning crystals.

Best Overall Category:
1st place: Lina Zhang and Rongjia Liu, Harry Ainlay High School, Edmonton AB
2nd place: Erica Rutz, Fellowes High School, Pembroke ON
3rd place: Milka Anbesse, Christiane Dizon, Kaitlyn Chan, St. Joseph College School, Toronto ON

Best Quality Category: Josée Aziz, Michelle Dillon, Katrina Albert, Natalie Georges, Rebecca Roufael, Collège catholique Samuel-Genest, Ottawa ON

Best Teacher's Crystal Category: Aura Pombert, Harry Ainlay High School, Edmonton AB

A special thank you to sponsors, Anachemia Science, for providing the material needed to grow the crystals and to BASF who provided the prizes. Also we couldn't carry out the event without the support of the volunteers and teachers who make this event a success every year. For more information about the National Crystal Growing Competition and National Chemistry Week 2009, visit *www.cheminst.ca/ncw.* We encourage you to get involved in the 2009 competition. ■



The kinetics version of Aesop's "The Hare and the Tortoise"