BOOK NOTES

Essays in Chemical History, W. A. E. McBryde, Peter Chung Chieh and Elisabeth A. Dixon (Editors), Canadian Society for Chemistry, Ottawa, Ontario, Canada, 1988. i + 79 pp. Paper (Typeset). $10.00 (US), $12.50 (Canadian).

This small volume of essays is based on papers delivered at a symposium on the history of chemistry held in 1983 at Calgary by the Chemical Education Division of the Canadian Society for Chemistry. All but three of the eight essays in the book are relatively straightforward biographical accounts of Canadian chemists, ranging from W. A. E. McBryde's carefully documented account of the career of Henry Croft, the first Professor of Chemistry at the University of Toronto, to N. T. Gridgeman's delightfully entertaining tale of the somewhat eccentric career of Donald F. Stedman of the Canadian National Research Council.

The remaining essays treat the careers of Otto Maass, Osmand J. Walker and Thorberger Thorvaldsen; the origins of the Chemical Institute of Canada; the teaching of history of chemistry at the University of Toronto; and the development of temperature-dependency equations in chemical kinetics. Only the last named essay, by K. J. Laidler, is truly disappointing, being little more than an abstract of a previously published (but otherwise excellent) paper in the *Journal of Chemical Education.* Ultimately, however, it is probably the biographical accounts which will prove to be of lasting value and which point to what one hopes will be a growing interest in the history and development of the Canadian chemical community.

Copies of the above book may be ordered from the Publications Department, Chemical Institute of Canada, 1785 Alta Vista Drive, Suite 300, Ottawa, Ontario, Canada, K1G 346 or from Chem 13 News, University of Waterloo, Waterloo, Ontario, Canada, N2L 3G1. Also include $1.00 for postage.

Chemistry in America 1876-1976: Historical Indicators, Arnold Thackray, Jeffrey L. Sturchio, P. Thomas Carroll, and Robert Bud, Reidel, Dordrecht, 1985. xxiii + 564 pp. Cloth (Typeset) $111.50, Paper $24.00.

By now this well-known book is (or should be) on the shelves of virtually every university library in the country. The good news, however, is that Kluwer has just released a paper edition with a purchase price which should also place it on the shelves of every chemist and historian of science - or certainly on the shelves of those who are working on departmental histories or are otherwise seriously interested in either the history of chemical education in the United States or the development of the American chemical community in general.

As the book's subtitle indicates, it attempts to provide statistical indices (usually in the form of graphs) of various trends which can be used to characterize (or otherwise act as indicators of) the growth and development of the American chemical profession in the century spanning the founding of the American Chemical Society (1876) and the near present (1976). Typical data sets and graphs range from trends in the total number of chemists in the U.S., through trends in the number of undergraduate and graduate-level degrees given in chemistry, the annual high school chemistry enrollment, and the total number of industrial research laboratories, to data on the citation rate of American papers in the chemical literature. More importantly, each data set is plotted in several alternative ways, in order to highlight various subtleties in the trends, and is also plotted relative to larger data sets which help to place the purely chemical information within its proper social context. Thus, for example, not only does one have a plot of the number of doctorates given in chemistry, but a comparison of this with the number given in all of the natural sciences, as well as in all fields in general - a result which shows that, although the number of degrees given in chemistry has displayed an exponential growth, it has actually declined relative to the total number of doctorates being granted in all fields.

Each data set is accompanied by a detailed historical analysis of the trends indicated by the graphs, and the volume is completed by detailed appendices on the data sources, the assumptions used in compiling and analyzing the data, and by an excellent bibliography and index.

A special discount coupon for members of the division wishing to order this volume can be found on the back cover.

TRANSLATIONS

The following experiment is again taken from Tiberius Cavello's "A Treatise on the Nature and Properties of Air," London, 1781. Readers wishing to submit their interpretations of the chemistry involved, complete with balanced equations, should send their answers to the editor by the copy due date listed inside the front cover. Answers will appear in the next issue along with a fresh puzzle.

To make Homberg's Pyrophorus: Mix together one part of sugar and three parts of alum; and let this mixture be melted and dried in an iron shovel over the fire, till it becomes a dark brown or blackish powder. In this operation it must be often stirred with an iron spatula. Any large pieces of this coaly matter must be bruised into a powder, and then must be put into a glass matrass or vial, having a long neck, and rather narrow than large. This matrass must then be placed in a crucible, or other earthen vessel, large enough to contain the body of the matrass, and about half an inch besides all round it, which space is to be filled with dry sand. This apparatus must then be put into the fire which must be raised gradually, till the whole becomes red hot, in which state it must be kept for about one hour or till a quarter of an hour after a weak sulphurous flame has begun to appear at the mouth of the matrass. The apparatus is then to be removed from the fire, and the moment that it loses its redness, the mouth of the matrass must be stopped with a cork, and when the whole is sufficiently, though not quite cold, the matrass must be taken out of the crucible, and the pyrophorus it contains, which is a blackish, mostly granulated powder, must be decanted into a dry phial, which must afterwards be kept exactly stopped, in order to preserve the pyrophorus for a long time. The principal properties of this substance are the following: As soon as a small quantity (sometimes a few grains of it are enough) of it is exposed to the open air, it quickly becomes red hot, and is capable of setting fire to paper, tinder, etc. If the air, and substance upon which the pyrophorus is dropped, are very dry, the accension is slowly, and sometimes not at all effected; but it may be promoted by breathing upon it; which shows that the pyrophorus requires moisture as well as the presence of air, in order to take fire. If the bottle is not closed very well, the pyrophorus will imbibe the moisture by small degrees, so as to lose its burning property in a short time. After combustion, the pyrophorus, or rather its ashes, will be found to be increased in weight. Although alum and sugar were directed above to be used for making the pyrophorus, yet it may be made with other matters, though perhaps not so well, nor with so much certainty; for the necessary and principal ingredients are the vitriolic acid and phlogiston; hence it may be made with any vitriolic salt besides alum, and almost any other substance capable of furnishing the inflammable principle, besides sugar.

The Answer to Last Issue's Puzzle

Aqua regia is a combination of the strong acids, nitric acid and hydrochloric acid. Traditionally this liquid was made using one part of nitric acid and three parts of hydrochloric acid. However, Cavello states his aqua regia is made with four parts of "nitrous" (nitric) acid and only one part of "marine" (hydrochloric) acid. This probably was to limit the production of chlorine gas for the following reaction:

$$4H_3O^+(aq) + 3Cl^-(aq) + NO_3^-(aq) \leftrightarrow NOCl + Cl_2(g) + 6H_2O$$

which occurs because the nitrosyl chloride present in the mixture catalyzes the reaction (1).

Regulus of antimony is the product of heating stibnite, Sb_2S_3, with lead in a furnace. The regulus metal is a 5-12% antimony compound containing some iron impurities (2). Grinding the regulus to a powder would expose some "free" antimony and facilitate the reaction.

The regulus powder reacts in the manner described by Cavello due to the reaction:

$$Sb(s) + 3/2\ Cl_2(g) \leftrightarrow SbCl_3(s);\quad \Delta H_f^\circ = -382.5\,kJ\ mol^{-1}$$

The heat of formation shows the exothermicity of the reaction which would account for the light seen as the antimony and chlorine come into contact. This reaction occurs at a "micro-level" because of the minute quantities of antimony and chlorine which come into contact; therefore, only a flash of light is seen. Antimony does not react with HNO_3 (3) and its high reactivity with chlorine is presented in many textbook photographs, such as the one on page 56 of our text at Notre Dame, *General Chemistry*, 2nd ed., by McQuarrie and Rock.

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References and Notes

1. M. C. Sneed and R. C. Brasted, *Comprehensive Inorganic Chemistry*, Vol. 5, D. Van Nostrand Co., Inc., New Jersey, 1956, p. 95.

2. W. Gardner and E. I. Cooke, Eds., *Chemical Synonyms and Trade Names*, 5th ed., Technical Press Ltd., London, 1948, p. 433.

3. W. H. Nebergall, H. F. Holtzclaw, Jr., and W. R. Robinson, *General Chemistry*, 6th ed., D. C. Heath and Co., Lexington, MA, 1980, pp. 935-937.

Hints for the Perplexed: Help in deciphering 18th-century chemical nomenclature and terminology for apparatus can be found by consulting Jon Eklund, "The Incomplete Chymist: Being an Essay on the Eighteenth-Century Chemist and His Laboratory, with a Dictionary of Obsolete Chemical Terms of the Period," Smithsonian Press, Washington, D.C., 1975 and W. Gardner and E. I. Cooke, "Chemical Synonyms and Trade Names," 6th Ed., CRC Press, Cleveland, 1968.

REPORT OF THE PROGRAM CHAIR

The obvious highlight of this meeting was the seven-session symposium on the History of Electrochemistry. Almost 40 papers on topics ranging from classical electrochemistry to such modern topics as electrodeless conductivity were presented over a four-day period. The speakers, in keeping with the international character of the meeting, came from many places on the globe including the United Kingdom and Czechoslovakia, as well as the expected speakers from the host countries of Canada, the United States and Mexico. In addition