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BONES AND STONES

What Do Chemists Learn from the Past?

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Chemists who are involved in the investigation of archeological materials are often asked, "Why study the past?" For most of us, archeological chemistry was not originally a part of our research program. As research chemists, we had developed some expertise in the study of materials (either of the material itself or the analytical techniques that could be used to characterize the material). Whether through our own readings and interest in history or through the contact with archeologists, we have become aware of the fact that our chemical expertise can be used to study those artifacts which are the reminders of mankind's past. As new techniques are developed and applied to the study of archeological materials, we continue to learn more about the way early man utilized a wide range of resources.

John W. Mallet (1832-1912)

While the application of chemical techniques to the study of archeology continues to bring about new knowledge, the idea of studying the past using chemical methods is almost as old as the formal study of chemistry itself. I was most surprised to learn this fact when I heard John Sharkey's address on John W. Mallet, the seventh president of the ACS (presented to the HIST Division at the 1987 National ACS Meeting in New Orleans). While I attended this lecture to learn more about this famous early chemist's long-time association with the University of Virginia, I also learned that his Ph.D. dissertation was based upon his work as an "archeological chemist". Mallet (1832-1912), a charter member of the ACS, made many contributions to chemistry including the determination of the atomic weights of Al, Li, and Au. However, I will ignore many of the other fascinating aspects of Mallet's research and focus on his early studies of gold artifacts.

During the summers of 1851 and 1852, young John Mallet traveled from his home in Dublin, Ireland (where he had already begun his study of chemistry at Trinity College) to Göttingen, Germany. He worked in the laboratory of the famous chemist Frederick Wöhler (1800-1882) who was himself a pupil of Berzelius. He brought with him a wide variety of Celtic antiquities from the Museum of the Royal Irish Acad-

emy in Dublin. Mallet's study of these artifacts was the first investigation of the chemical composition of pre-historic Celtic materials. The scholarly dissertation based upon his study of metal objects, precious stones, amber, glass, and pigments won Mallet a Ph.D. degree at the end of the summer of 1852 (a year before he received his A.B. degree from Trinity College). But what motivated Mallet to embark on such an unusual application of his chemical training? One can only surmise from the rest of Mallet's career that one reason was his very broad-ranging interests. Throughout his career he had an interest in ores and metallurgy, as well as other aspects of what was described as "Industrial Chemistry". Mallet's particular interests in the history of metals is probably a result of his involvement in the family business. In the first decade of the 19th century, Mallet's grandfather had moved to Dublin (from Devonshire) to establish a prosperous iron, copper, and brass foundry. John Mallet's father, Robert Mallet, was an active scientific investigator who enlarged the foundry into a company which dominated the engineering developments in Ireland during the period of industrial growth prior to 1850. John Mallet was clearly stimulated by his father's interest in metals and by his father's extensive library. However, Mallet also developed a zest for scientific investigation as the means to understand materials. For Mallet, research answered the questions suggested by his readings. The metal ornaments that represented Ireland's Celtic heritage interested him, in part, because he hoped that they could reveal something about the early metal working technology of these ancient people.

The analysis of small golden Celtic ornaments by "wet chemical" methods was itself a great feat in 1852. The results had sufficient accuracy that Mallet could do much to interpret the uses of the materials, the technology used by the Celts, and the provenance of the artifacts on the basis of the ores which were used. John Sharkey summarized Mallet's findings (1):

"1. Specimens of what was believed to be Celtic ring money (gold wire bent in the form of rings) apparently were used as currency, ... for [Mallet] found that all specimens were remarkably constant in composition. Since the composition was constant, their relative values were determined by their proportionate weights. Mallet also found that ornaments classed in ancient literature as "pure gold" and "fine gold" were graded merely on their color. Chemically speaking, they contained as much as 25% silver and more than a trace of copper.

2. Though Irish museums are rich in gold ornaments of early Christian times, there are remarkably few silver articles. Mallet explained this by the fact that silver, unlike gold, is rarely found in the native condition, and working from its ores is a more difficult process [beyond the technological skills of the Celts].

3. The bronze items examined varied little in composition. This he ascribed to the fact that only alloys of copper and tin in specific proportions would have the necessary hardness for weapons and utensils. ... He demonstrated his skill in trace analysis, by finding, for the first time, small amounts of zinc [which he traced to impurities in the Cu] in several Celtic bronzes."

John Mallet was a great advocate of applying scientific knowledge to the "useful arts". He certainly was pressed to use all of his knowledge, technical skill, and ingenuity when, as chief of ordinance for the Confederate States of America, he was able to overcome the acute scarcity of materials to continue producing munitions for the beleaguered southern cause. Later, in 1869, Mallet was the first to teach a systematic and comprehensive course in "industrial chemistry". He was also convinced that chemistry was best learned through experimentation. Right after the Civil War, Mallet accepted a professorship of chemistry at the Medical College of Louisiana (later to become Tulane University) and organized the first course in which the students did the laboratory exercises themselves. In the laboratory course that he taught for many years at the University of Virginia, Mallet's philosophy of teaching reflected the same ideas that led him to analyze Celtic ornaments. He taught quantitative analysis with a special attention given to substances having "useful application in the Arts" (or connected with agriculture).

Professor Mallet clearly recognized the value of learning more about man's early technological skills through the chemical analysis of artifactual material. He used this knowledge and his careful studies of history to aid him in his long career as an inspirational teacher. Mallet was quoted in Hugh Spencer's book (2): "In teaching a science one should always have in mind the steps by which mankind at large has gradually advanced knowledge, and should carry the pupil, not formally, but unconsciously over pretty much the same ground." His recognition of the importance of history was emphasized by his lifelong efforts to collect objects that illustrated the growing contributions of chemists to the betterment of society. As judge of chemical manufacturers at the Philadelphia Exposition in 1876 (and the 1893 exposition in Chicago and that of 1904 in St. Louis), Mallet enriched his collections of samples and models which illustrated chemical manufacturing. It is most unfortunate that Mallet's extensive Museum of Industrial Chemistry (and his collection of Confederate munitions) was lost in 1917 when a thief burned the Mallet Laboratory Building (at the University of Virginia) in an attempt to cover up the theft of platinum and goldware used in the quantitative analysis laboratory. It is ironic that these collections were destroyed in the search for gold when it was the analysis of gold objects that started the collector on his scientific career.

References and Notes

1. J. Sharkey, "John William Mallet - American Chemical Society President in 1882", 194th ACS National Meeting, New Orleans, LA, 1987.

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BOOK NOTES

American Chemists and Chemical Engineers, Wyndham Miles (Editor), American Chemical Society, Washington, D.C., 1976. x + 544 pp. Cloth (Typeset) $29.95.

Though this volume has been in print for several years, we wanted to explicitly bring it to the attention of our readers. The centennials and sesquicentennials of a large number of American chemistry departments are due to be celebrated in the next few years and will doubtlessly generate a spate of departmental histories. Persons writing these histories, as well as those interested in the history of the American chemical community in general, will find this volume to be an indispensable reference source. Containing short biographical sketches (with references) of 517 American chemists and chemical engineers, spanning nearly 300 years of American history, the book focuses on the "average" chemist rather than on the "super famous". This emphasis is its most valuable asset and would-be departmental historians will find it to be a useful first step in tracking down their early faculty. It is also a volume which should be found in the reference section of every science library, however small.

The good news is that Dr. Miles has recently begun work on a second volume of biographies, and we hope that many of our readers will contribute to this worthy project by responding to Dr. Miles' questionnaire in our *Questions and Queries* column.

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

Chemistry at UTK: A History of Chemistry at the University of Tennessee-Knoxville from 1794-1987, George K. Schweitzer, Department of Chemistry, UTK, 1988. 193 pp. Paper (Camera-Ready). $15.00.

Histories of chemistry departments or, indeed, of science departments in general, don't fare well among book reviewers in the history of science literature. The standard complaints are that they lack a general theme, are overburdened by biographical sketches of the faculty and are of interest only to graduates of the department concerned. All of these complaints are to some extent true, but the accompanying implication that the way to avoid these problems is to remove the detail of names and dates and to focus instead on some general social issue, such as graduate chemical education in America, misses the point because such a book would no longer be what it was intended to be - namely a specialized history of the department in question. The simple fact remains that the first and primary obligation of such a history is to be an accurate record of who was there, when they were there and what they did. As anyone who has worked on a departmental history can testify, the effort needed simply to track down a century of faculty, graduates and buildings - usually lost in overwhelming obscurity - can be exhausting and leave little time or energy for setting the result within the larger context of chemical education in America. At best all one can hope to do is to tabulate and summarize the local information as thoroughly as possible so that the historian in search of the "big picture" will find the result a useful data point.

In the book under review, the author has done his job better than most. In addition to tracking faculty, buildings and graduates, he has given a fair summary of changes in the curriculum, degree requirements, the evolution of fellowships, research assistantships and graduate education. The only missing item is an on-going description and evaluation of research and scholarly activity. The book is also well illustrated and properly referenced.

QUESTIONS AND QUERIES

* Dr. Paul R. Jones is in the process of assembling *A Guide to Published and Unpublished American Chemical Genealogies*. If you have done an unpublished genealogy of your department, please send a copy to Dr. Paul R. Jones, Department of Chemistry, University of New Hampshire, Durham, NH 03824, Phone (603) 862-1550.

*. Dr. James J. Bohning is in the process of assembling *A Guide to Published and Unpublished Histories of American Departments of Chemistry* and *A Directory of Persons Teaching History of Chemistry Courses*. He is also putting together the archives for the Division for the History of Chemistry. If you have items of interest relating to any of these projects, please contact him at the Department of Chemistry, Wilkes College, Wilkes-Barre, PA 18766, Phone (717) 824-4565, extension 4614. Relative to materials relating to the history of HIST, Dr. Bohning notes that he will take care of all sorting and organization, so now is the opportunity to unburden your file cabinets with a minimum investment of time and effort.

* Wyndham Miles and Robert Gould are in the process of putting together a second volume of *American Chemists and*