Preserving the History of Modern Chemistry

Ronald Brashear

Chemical Heritage Foundation, Philadelphia, PA, USA

Introduction

Today I want to provide a broad overview of the issues that concern how we can preserve the history of chemistry and chemical engineering starting in the late 20th and 21st centuries. I don't have time to go into great detail as this is a complex subject, but I hope I can begin a discussion on the matter. I expect that many of these issues are not new to you, but it is rare to discuss them all together as a distinct problem set, so I hope you find this to be a useful exercise. I believe this topic to be of particular interest to us at the Chemical Heritage Foundation (CHF) because we should take the lead and set the example of how to collect the history of science and technology among collecting institutions.

Today I hope to cover many of the issues involved in collecting, preserving, and making accessible to historians a variety of materials: (1) archives, (2) printed materials, (3) physical locations and material culture, (4) digital materials, and (5) oral histories.

Archival materials

For the most part, the greatest resources for the historian of modern chemistry are archival collections. They are the grist of the historian's mill and critical for the historical record. These records have historically been primarily in paper format, though as we know, archival collections can have practically anything in them. They have often been collected by individuals who have gathered whatever they had and placed them in folders, boxes, and even paper bags. They will have letters, memos, offprints, photographs, conference programs, menus, postcards, memorabilia, and anything else they felt the need to keep.

Archival collections can be that of individuals, companies, and other organizations. Each group has different and very specific issues that archivists need to deal with. Personal papers reflect the life of an individual and perhaps others in their family. Some people keep their correspondence and other materials in a very diligent fashion (often the case with engineers) while others pile stuff in drawers and boxes in the order in which it was obtained (often the case with scientists). There is a personal nature to this material and individuals are often unclear about the need to keep and share this others. And scientists are occasionally unclear as to why anyone would want to read their personal correspondence; many think their published record should be sufficient and that more personal materials are irrelevant to their scientific achievements. This is where education is so very important; archivists have to find ways to connect with people and their families throughout their careers and to help them understand why we need to know as much about them to preserve the historical record. Historians must also do their best to make people realize how their stories will be told; it might be a difficult challenge but it could be very worthwhile. There should also be some clarity on whose papers we should collect. Should it just be the prize-winners or are there valuable stories among the less notable stars of science and engineering. Undoubtedly all these stories should be preserved but practically this is not possible for all the archives to do. Most archival collecting policies will target high-profile scientists and engineers and others who worked on projects of great historical importance (like the Manhattan Project, for example). It is very likely that regular "line" academic scientists and engineers will not have their materials preserved. Basically, for someone to have their story preserved, they need to have a champion who will

let us know that this is a person who needs to have their archival legacy preserved. And even that does not ensure success.

The archival records of organizations like the American Chemical Society, the IUPAC, the Smithsonian, and others are also worth preserving as they have important information as to how science is organized and make community decisions. These organizations may not be too concerned with their history initially but they eventually develop some method of preserving founding documents and records of their meetings and decisions. It is important for these organizations to eventually partner with an archive (or create their own) to provide a resource for historians. IUPAC has partnered with CHF to preserve a great deal of their historical materials and these have proven to be one of the most heavily used archives at CHF. Even if these places create their own archives, it should be done in a manner that makes them open to all researchers. Fortunately, most national governments have created archives to preserve their history (in the USA the National Archives and Records Administration takes on this responsibility) but recent events show us that these are not supported to the extent that is really adequate. Budget shortfalls prevent proper processing and storage of these materials and make access difficult. There are promises to digitize much of these national archives but how quickly and effectively can this be done and how sustainable will these efforts be? Anything we can do to ensure that our government representatives know the value of archives is worthwhile, but with the many priorities that a national government has, it seems that archives does not make it very high on that list.

Perhaps highest on the list of archives that are in risk of being lost are the historical records of chemical companies. Companies maintain a records-management policy but that often means that most records are destroyed after a certain period of time. The reason that many historical materials of chemical companies exist is that some employees recognized the value of certain materials and hoarded them or plucked them out of the wastebaskets. Sometimes the company realizes the error of its ways and collects these materials in order to tell its history. The corporate records at CHF (Dow, Union Carbide, J.T. Baker Chemical, Hercules, Rohm & Haas, Spinco, Beckman, etc.) are often a result of retired employees contacting us when they can no longer keep the materials they have collected and asking if we want them (and yes, we do). And sometimes we then have to work with the corporate lawyers to ensure that there is no intellectual property in the material so that they will release the material to us. Fortunately, in general companies have proven to be very good to work with in these matters. But in order to ensure that future materials are not lost, we must be able to build relationships with these companies and constantly keep track of mergers & acquisitions in order to tell when materials might be available or at risk. If one company buys out another, they often do not desire to keep their former rival's materials around and we must be ready to scoop it up as the window of opportunity is very short.

For an institution like CHF, we have a very broad collecting policy and want archival records of every type. So often it can seem like our collecting is random when actually it is opportunistic. To offset this, it can be worthwhile to consider special programs to collect in depth in a very focused area. This seems like it is so obvious, but it requires a lot of things to fall into place in order to be successful. One successful program is a recent one done by the Huntington Library in southern California called the Aerospace History Project. Recognizing that the history of the aerospace industry in southern California was vast yet not found in the archival record, the Huntington joined with the University of Southern California to spend several years in scouring the Los Angeles area to collect whatever still existed on the topic. Because of the extent of the project—identifying potential sources, collecting them,

processing them, and mounting an exhibition and publication about the topic, it required substantial funding beyond that in the Huntington's normal budget. Funding was obtained from the National Science Foundation and the Northrop Grumman Foundation and the project was a great success. CHF did similar projects in its earlier history (polymer science project) and is currently working on the Beckman Legacy project which will hopefully help preserve the legacy of Arnold O. Beckman.

Even assuming that we can successfully collect much of the modern archival record in chemistry and related areas, this can only be done realistically if there are institutions with room to store and staff to process them. In 2010 CHF was at a critical time in its collecting history. A good portion of our building on Chestnut Street in Philadelphia was used to house our collections, but our archival storage was past full capacity. We were at 105% capacity with the excess being stored offsite at a repository in Delaware for a monthly fee. Fortunately, the institution prioritized archival storage as a priority and thanks to a local foundation we were able to convert an adjacent building into a modern archival storage facility, the John C. Haas Archive of Science and Business. It was opened in late 2013 and featured a state-of-the-art high-bay mobile shelving system dedicated to archival record boxes. But in the 15 months we have been using it we have reached 15% capacity. If we continue acquiring new archives at this rate, we can expect to fill the building by the year 2022. If we run out of room again, that could be a problem because few institutions are collecting broadly and deeply in science and technology; so continuing to give CHF the room it needs to collect archives will be important for future generations of historians!

Printed Materials

In the 21st century, collecting printed materials is a new and complex problem for libraries. With the continuing digitization of printed books and journals, the modern academic library is naturally moving to dispose of printed books (and the costs of needing to store them) and focus on providing access to information through digital means. This may be fine for academic libraries that are looking for more efficient and economical ways of providing access to information, but what about historical research libraries like the Othmer Library at CHF? These libraries provide a valuable niche by collecting printed materials by seeing them as historical artifacts, not simply containers of information. With the desire to provide artifacts for exhibition and/or high-resolution reproduction—not to mention our mission of preserving the world's chemical heritage—it makes sense for CHF to focus on collecting historical printed materials. Not all of them, of course, but then which ones? Certainly rare books (hand-printed books before 1850) are worth preserving despite the regular digitization of these titles. For modern post-1850 books, it becomes difficult to preserve everything due to the vast number of printed primary sources to be had. In this area CHF focuses on modern books that are not typically collected by other academic libraries. These consist of scarce titles (very few copies located in the OCLC database) and corporate and industry publications (particularly privately-printed corporate histories and trade journals). We also look to collect all editions of influential textbooks as these are valuable to study and to see how the canonical scientific and engineering information changes over time. For now, most sources of these works for CHF are academic libraries that are disposing of books and journals as well as corporate libraries that downsize or go out of business. But we occasionally find that the most interesting sources of obscure modern printed materials are collectors who have had the foresight to collect things that nobody else collected (for example, materials relating to the development of electronics, genetics, computers, and mass spectrometers). The more we can identify these collectors and work with them to give these materials to libraries when they no longer need them, the better off we will be.

A potential concern for the future of printed materials is the fact that they may become obsolete soon. The future of publishing is not in traditional print but in digital formats (e-books, online resources, etc.). The publishing paradigm is changing now and rather than libraries being able to buy books and have them permanently, they now have to license content from publishers and are not guaranteed of having access to digital publications should their license expire. The collectors of digital publications will not be libraries or individuals but more likely the publishers themselves. What should happen if these publishers go out of business? Fortunately, entities like JSTOR and the Hathi Trust have been developed to ensure long-term access to publications, but the sustainability of these efforts is hard to predict. Things in digital publishing are likely to evolve but for now there is some unease. And for those of us who like to exhibit physical books and articles that mark an important discovery, what do we do now that these will be described in digital publications? Do we exhibit a printout or perhaps do we display a digital display showing these works? Perhaps not a major issue but one that may perplex future history of science exhibitions.

Physical Locations and Material Culture

This may not be a tremendous problem in chemistry, but it has been in other areas of science and engineering, and with the recent Sites of Chemistry conferences, I thought I should include it. Early 20th century observatories like Mount Wilson and Lick Observatory are barely hanging on and may be forced to shut down. Some of the first linear accelerators are also at risk. Much of the United States' early industrial sites have disappeared due to the fact that they are not appreciated for their industrial aesthetic not to mention possible contamination. While we may appreciate that many of these sites may not survive or stay in their original condition, the Historic American Engineering Record (HAER) was established in 1969 by the National Park Service, the American Society of Civil Engineers and the Library of Congress to document historic sites and structures related to engineering and industry. This agreement was later ratified by four other engineering societies: the American Society of Mechanical Engineers, the Institute of Electrical and Electronic Engineers, the American Institute of Chemical Engineers, and the American Institute of Mining, Metallurgical and Petroleum Engineers. Appropriate subjects for documentation are individual sites or objects, such as a bridge, ship, or steel works; or larger systems, like railroads, canals, electronic generation and transmission networks, parkways and roads. HAER helps train people to document, photograph, and produce blueprints and engineering drawings for deposit in the Library of Congress to provide some historical record of engineering and industry. There are other international activities ongoing as well, such as Europa Nostra's Industrial and Engineering Heritage Committee, the European Route of Industrial Heritage, and the Chemical Heritage of Japan project.

The most notable sites of chemistry in the 20th century are chemical laboratories (both academic and industrial) and chemical industrial plants in general. These are very high-risk sites due to the critical need for space in universities and industries and to the difficulty in arguing for "historic" sites to be conserved at the expense of current research needs. If we can count on HAER to document industrial sites, we might want to look at how we can document the academic laboratories. What we tend to have are photographs of work in laboratories that find their way into archival collections but we should look at more systematic ways to document modern laboratories. The logical place to start in the US is with the American Chemical Society's National Historic Chemical Landmarks program. This program aims to celebrate seminal historic chemical activities by recognizing the site with a plaque, even if the site is no longer in existence or in its original form or location.

Unlike large physical sites that are hard to sustain, smaller historic artifacts are easier to preserve, but who is actively doing so? Robert Anderson posits that only CHF is collecting traditional chemical historic artifacts and our collection is predominately 20th-century in scope. But as we are now nearing capacity it will be difficult to be comprehensive in collecting the 20th century. Rather than a complete collection of every chemical science instrument, we have to focus at the present on artifacts that have an important historic story to tell. This has been a challenge for us, primarily because of staffing and space. We have depended on a Historic Instruments and Artifacts Committee to help advise us on what to collect, but it would benefit from expanding the group's topical expertise, and for CHF to be aggressive in collecting chemistry's material culture we need to find additional storage space like we did for our archives. And chances are that material will become available as smaller museums go out of business and as colleges and universities look to find homes for these instruments (assuming they don't just throw them away, as sometimes happens).

Additional material objects that can be collected relate to the products of chemistry, from Bakelite to silicon chips to nylon dresses and Pyrex glassware (if we confine ourselves to synthetic material). These are important items to collect as they exhibit the importance that industry has in developing and making items that we use every day and that we can't imagine being without, making for a strong connection in how science and engineering has an impact on modern society and culture. Because of the ubiquity of much of this type of material, we can afford to collect much of it as we develop a need for specific exhibition material.

Digital Materials

There is a growing amount of digital materials being produced, either as surrogates of physical objects or as born-digital objects (email, photographs, etc.). This material will only continue to grow as historians appreciate the value of having a critical mass of data available for remote research and digital humanities projects. For digital archivists that collect and create this data and make it available on the internet, this is a tremendous resource problem. In order to ensure that every unique digital object is described properly so that researchers can find them and use them efficiently there is a great deal of behind-the-scenes work in capturing images and texts, providing consistent descriptive metadata, establishing digital rights management, and developing user-friendly websites. This is a resource-intensive problem and requires large teams to succeed. All of this is on top of staff and resources to manage physical collections as well. While academic libraries can manage this by downsizing physical collections and repurposing staff for digital activities, smaller historical research libraries have to find new resources to have a digital presence. CHF has addressed this need by adding additional staff to the library in order to initiate a digital collections program. This allows us to address our digital activities appropriately by developing in-house expertise and establishing a robust digital infrastructure to support a long-term online digital collection. This Digital Library team will allow CHF to begin dealing with the often difficult issues of digitization and to take the lead in how to manage and preserve scientific and engineering history in digital form.

An important part of having an active digital collections program is being able to ensure the preservation of digital objects. This is still an issue that is being dealt with, but some things have become clear. Early in our digital lives, the big issue of preservation was how long the physical storage medium (CDs and DVDs) would last. As we have moved to electronic and cloud-based storage, that issue has faded from the scene. But this has been replaced by the issue of software volatility. Even if we preserve digital texts, images, and audio and video

files, the software in which it was produced has a relatively short-lived lifespan. As software formats change, archives will have to be prepared to migrate their data from one format to another at various intervals. Failure to do so regularly may lead to an eventual inability to read the data we have fought hard to preserve.

Another important digital preservation issue is that of websites. Much ephemeral material that used to be printed (corporate information, newsletters, conference programs, etc.) are now appearing only on the internet. This is rarely archived properly by the hosting institutions and so disappear from existence after a short time. While printed ephemera was often saved and eventually collected by libraries, who is saving digital ephemera? Visionaries like Brewster Kahle, founder of the Internet Archive, recognized this early on, but can we rely solely on this organization to preserve our internet history? Or should organizations like CHF actively preserve websites of places that fit their heritage mission? I would argue in favor of adding this activity to our mission but it would require some additional resources that may be hard to come by. Still, I think it worth pursuing.

Oral Histories

It is generally considered that the best way to capture recent historical information is through the creation of oral (or video) histories. This has been an excellent way to capture voices that might have been lost due to their subjects' relative anonymity, especially in documenting labor and social history. In history of science and technology, oral histories developed primarily as a way to learn more details about the lives of relatively prominent individuals such as Nobel Prize winners or other luminaries. Eventually historians began producing oral histories of more obscure subjects to try to preserve marginalized voices. One example was the American Institute of Physics' (AIP) Center for the History of Physics' history of big science project. Knowing that many physics projects were large-scale efforts of hundreds of people from different institutions, the Center selected a few projects to document as they happened by taking oral histories with scientists, technicians, graduate students, and others involved in the project, before their memories faded and everyone went their separate ways. The Smithsonian and Johns Hopkins did a similar project with the History of the Space Telescope. Since the AIP started their program in the 1960s they have perhaps the largest collection of oral history interviews, over 1,500. The Chemical Heritage Foundation was founded as the Center for the History of Chemistry in 1982 and its early activities were modeled on those of the AIP. As a result, CHF began conducting oral histories in the 1980s and has conducted some 425 up until now. Like the AIP, CHF's oral histories were focused on notable individuals but we began moving into modern oral history practice by focusing on collecting a broad sample of voices in a number of project areas such as atmospheric science, mass spectrometry, synthetic rubber, women in chemistry, and the chemical history of electronics. It seems clear that oral histories are, when used in conjunction with other historical evidence, an important resource for history of science and technology, and CHF will endeavor to be a leader in this area.

Conclusion

In conclusion, let me quickly go over some points I tried to address in this paper. I think that in order to be successful in preserving the history of modern chemistry, it is crucial that CHF take an active role and work with partners, if not take the lead, to:

- educate scientists and engineers in why they should preserve their personal papers
- partner with organizations to preserve their historical record
- let companies and their employees know that it is in their best interests to preserve their history

- effectively store the archival record of chemistry
- collect scarce printed materials
- find ways to document sites of chemistry
- continue to collect the material culture of chemistry
- find new and innovative ways to use and preserve our digital heritage
- continue to collect oral histories

I hope this was a useful starting point and I look forward to continued discussion and action going forward.