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Organology through the Digital Revolution

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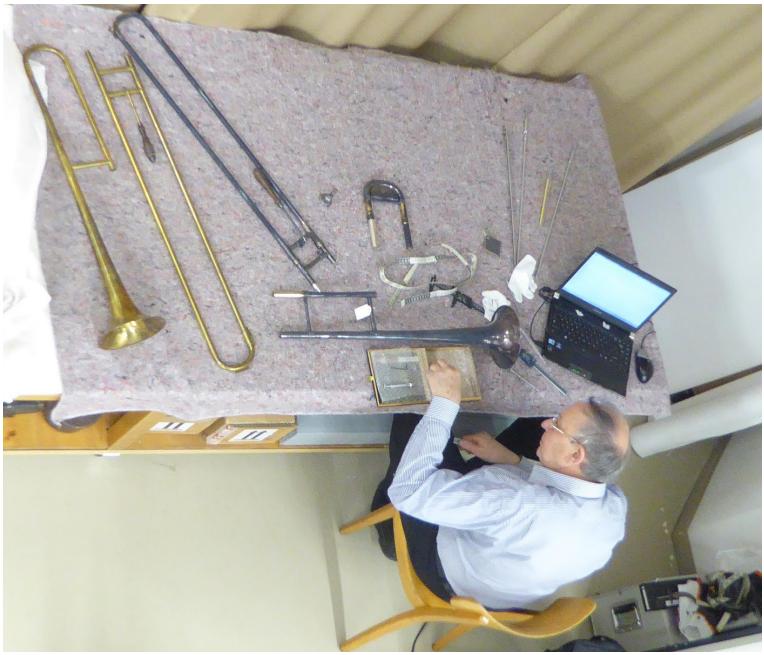
Long-time members of AMIS will all have experienced the revolution in our ways of working that has come through the availability of cheap computing power and the connectedness of the internet. Some younger members may be surprised at the way the study of musical instruments was carried on in the 1970s. In the course of the digital revolution, some aspects of organology have changed radically, other aspects hardly at all. In 1971, efficient communication with other scholars meant using a mechanical typewriter to put patterns of ink on pieces of paper, signed in ink (blotting paper to hand), thumbing through an address book and addressing an envelope, licking and sticking on a stamp of the right denomination, then entrusting it to the postal service: it would arrive days later. Today we send only Christmas cards this way, but in the 1970s and 1980s, this was how we shared findings with other organologists, asked them questions, and ordered photographs and publications from museums. (And there was hardly any junk mail.) It was in 1985 that I persuaded the University of Edinburgh to provide me with an early form of PC (personal computer) to assist in managing its Collection of Historic Musical Instruments. A mere three years later, I had an e-mail account, though it was little use to begin with, as few others had adopted e-mail. By 1995, I was putting up web pages including a picture gallery of collection instruments, followed in 1996 by a complete list of holdings. The PC, which occupied much of a table top, ran on 3½-inch diskettes (floppy disks), each able to record 720 KB; one disk held the computer software (all of it), and a second held all the data one was working on. Personal storage of data was in filing systems for paper records. My first data file was a notebook started in 1969, in which I wrote memos on interesting instruments I saw on my travels. Before e-mail was widely adopted (i.e., before the mid-1990s), the telephone was the vital means of rapid communication—all by landline, of course, so it only worked when the recipient of a call was in a specific location (and ideally awake, if the call was across time zones).

In general, research on historic musical instruments needs to be carried out across many collections in order to compare relevant specimens,



The author using manual methods in 2018 to measure instruments in the Basel Historical Museum. Photo by Bruno Kampmann.

or to assess the output of a maker or school of making. Research using fixed or expensive laboratory equipment (such as an anechoic chamber or x-ray equipment) is often limited to a single collection for practical reasons. Research on the playing properties of historic musical instruments has perhaps seen little change: it may require substantial musical performance experience, and it can involve having a sample of playable instruments side by side—considerations untouched by the digital revolution. Research on the materials and construction of historic musical instruments can involve expensive materials analysis equipment and scientific staff. In the 1970s, this was generally carried out on laboratory or hospital premises and accessible only to the better- resourced (or better-connected) museums. Now portable x-ray fluorescence is affordable and can be part of a museum's equipment.

Organologists researching the design of historic musical instruments employ various techniques, not all of which have changed. There is still an important role for handheld measuring tools, which produce data with a precision comparable to that of the measurement methods of handcraft instrument makers. In the 1970s and 1980s, hand-tool measuring and occasionally radiography were the only means available to those who drew

or copied instruments, with the results recorded on paper. While data is now usually recorded and processed on a laptop or other computer, physical measuring is supplemented rather than replaced by high-tech methods such as laser location, computed tomography, and neutron imaging. The use of computer-aided design (CAD), to process measurements for making technical drawings and as a research technique, came into use toward the end of the twentieth century.

Searching, Archives, and Images

Many study practices have become hybrid, with paper retained for backup and for reading drafts and proofs. It is interesting that some museums still main hand-written inventories in books (on paper) for records that should be tamper-proof. Fifty years ago, information retrieval was beginning to enter the digital age. The first university library in my experience still had a "guard-book" catalogue with the entry for each book typed on a slip, which was then pasted in sequence in a large loose-leaf leather binder. The catalogue was a whole room full of these, with desks for consultation. Small libraries and individuals did much the same with card indexes or slips of uniform size. I remember carrying out my first online database searches in the 1970s: before the advent of the internet, communication was over telephone lines with one's telephone handset placed in a cradle-like modem. Librarians developed skill in query formulation, creating complex (but effective) search strategies that were far more sophisticated than everyday Google searching.

The availability of online digitized resources does not seem to have reduced the need felt by organologists to travel, but it has made data gathering more efficient. Aggregations of collection resources such as Clinkscale Online, MIMO, MINIM, and the Galpin Society Data and Reference web pages have provided a short-cut to instrument identification, while digitized reference, iconographic, and archival materials, including books, newspapers, patents, etc., have reduced the need for time-consuming, though often enjoyable, travel to far-flung cultural centers.

The study of instrument makers has leapt forward thanks to extensive digitization of archival sources. Fifty years ago, the organological world was unaware of many of the records on paper that existed. To some extent, the focus of organological interest was further in the past than

The author carrying out an online database search in 1978 using a terminal with a modem.

the period covered by the factory order books and stock books that survived, usually badly cared for, on the premises of successor manufacturers. Some records have now been properly digitized, while others have been transferred to professionally run archives still requiring a scholar to visit in person, but at least their existence is flagged by archival finding tools. Added to this is the mass digitization of census and other material by the genealogy industry: sources are now available that the previous generation of organologists either didn't know about or found difficult to use. Research on provenance and the past use of instruments generally combines study of extant instruments with iconographical, archival, and library research, and has also been aided by online services.

Photography has always been a critical tool for the organologist. The digital revolution has brought accessibility, speed, and quality to its use in ways barely imaginable even in the early part of the twenty-first century. There is still an important place for the professional photographer exercising significant skills and a trained eye, and deploying expensive equipment for lighting as well as for image capture. However, the techniques have changed completely. As recently as 2003 processing photographs involved dark rooms, tanks of chemicals, and hanging films up to dry. The results were beautiful high-resolution prints on coated paper (to be sent to printers along with a typewritten text) or 35 mm transparencies (for use in a slide projector in a lecture or conference presentation). All this was quite costly. Digital photography is immediate and available to all, and

so cheap that it is practically free; it can be repeated *ad libitum* until the results are fit for the purpose.

Over fifty years, our understanding of the science of musical instruments has made impressive advances, and research on the acoustical properties of historic musical instruments has developed accordingly. Few of the old laboratory techniques continue to be the most fruitful. Developments are particularly striking in data capture and processing: as late as the 1990s we were still plotting charts on graph paper, and we were pleased if our apparatus had a pen automatically moving across the paper. Today, producing a scientific paper often involves no paper at all: not in experiments, conference presentation, or publication.

Conferences, Publishing, and Storage

Conference presentation before PowerPoint had a physicality that would now be seen as clunky. My first conference paper was at the Metropolitan Museum of Art, New York, in 1985 (on the Glen Account Book): this involved careful preparation of graphs, which were hand-drawn on paper and photocopied onto transparent acetate sheets. At the Met, the acetates were placed in turn on an "overhead" projector. Since they could be back-to-front or upside down or oriented sideways, there were seven wrong ways of doing this, and only one right way.

Although online meeting platforms became an increasingly used communications tool in the first two decades of the twenty-first century, the COVID-19 pandemic in 2020 saw internet-mediated services completely replace face-to-face business meetings, conferences—and teaching. At the time of writing, it is not clear to what extent the old forms of people-gathering communication will be reinstated. Possibly the traditional style of AMIS meeting will soon seem as distant as manual typewriters and overhead projectors.

In 1971, scholars seeking accessibility and permanence for their output would aim to have it published, and in printed form deposited in libraries worldwide. This practice continues, although library policies increasingly reject the acquisition and retention of paper media, especially journals. The durability of Web publishing of material beyond formal journal articles is unknown. With increasing publication by open access, the costs of scholarly publication are being moved from user to author. In

many cases, of course, academics and other scholars are the main users of publications, so changing the publishing model may seem painful initially, with increased accessibility paid for by high costs in journal article processing fees.

In the digital world accessibility is quickly and easily achieved, but digital preservation of research data and reports is another matter. Research archives are only now being actively addressed. The costs of digital storage are negligible, but the costs of metadata creation, software migrations, storage maintenance, and information retrieval are likely to remain significant. There is also the risk—low, we hope—of loss and corruption when data is transferred to future software systems.

It can be argued that the science-influenced study of musical instruments, facilitated by digital developments, has propelled organology from a rather dilettante and often merely descriptive pursuit to a significant area of scholarship, drawing together disciplines of archaeology, cultural and socio-economic history, acoustical and materials science, and musicology.