Book Reviews

AIP Study of Multi-Institutional Collaborations. Phase 1: High-Energy Physics. AMERICAN INSTITUTE OF PHYSICS. CENTER FOR HISTORY OF PHYSICS. New York: 1992.

Since the end of World War II, the world of science has undergone some major changes. Best known perhaps have been the advances in scientific and technological knowledge that have been popularized by the media. It was during the turbulent decade of the 1960s, however, that widespread skepticism and suspicion of science as a wholly constructive social force began to spread. This shifting attitude has prompted a growing public interest and occasioned a burgeoning of academic inquiry concerning the nature and value of science as (a form of) knowledge. Important changes have also occurred in the organization and rationalization of scientific effort. In the wake of the rise of Big Science, it has become clear that the conduct of scientific research has been moving away from earlier more insular intra-institutional models of organizational structure and activity and towards more complex forms of organization. Briefly put, the *scope of the organization* of scientific effort no longer always coincides (if it ever did) with the *scope of institutional structure*.

As its name suggests, the *AIP Study of Multi-Institutional Collaborations* (hereafter, ASMIC) addresses the archival issues and challenges presented by this organizational phenomenon in science. It is one of a growing number of interesting American archival forays into the domain of science and reflects the broadening public and academic interest in science as a discipline and as a socio-historical phenomenon. Initiated by the American Institute of Physics in 1989, the ASMIC project won support from the United States' Department of Energy, the National Historical Publications and Records Commission at the National Archives and Records Administration, and the National Science Foundation. A long-term multiphase study, its publication on high-energy physics completes the first phase; a second phase on collaborative research in space science and geophysics is well under way. A third, final, study will investigate other fields of science, including biology and oceanography. Ultimately, the project hopes to identify the various forms of collaboration in each science and to develop templates for documenting them.

There are a number of reasons for the emergence and growth of this organizational innovation. First, the emergence of new information and communication technologies over the last twenty-five years—database technologies along with local as well as global network systems—is beginning to have a destabilizing effect on more traditional, institution-centred knowledge production activities. Second, the scope and definition of scientific puzzles and domains (puzzles being a term from Thomas Kuhn) are changing in such a manner as to promote multi-institutional, multi-disciplinary, multi-sectorial, and even multi-national collaboration. Third, a growing emphasis, for all kinds of reasons (politics, policy, economy), on problem-rather than discipline-focused research is promoting closer cooperation among various specialized agencies and sectors. Finally, the development in some areas of science of exciting, highly specialized but very expensive technologies for conducting certain kinds of experimental research has also encouraged the interinstitutional rationalization of resources.

To a certain extent, science, unlike the humanities and social sciences, has always been conducted by groups rather than by individuals (the Republic of Science).[1] The scale and greater formality of these new organizations of effort, however, has prompted the introduction of the term "collaborations." Already, some observers of science—of the American scientific scene, at least—have suggested that the increasing complexity of scientific organization is making research and writing on single research institutions inadequate to represent the social system of the production of scientific knowledge. No longer do the walls that enclose laboratories provide a reliable analytical framework for understanding how science works. Increasingly, laboratories are said to have no walls; members of the scientific establishment have begun to refer to "collaboratories." Indeed, at Canada's National Research Council, the latest set of strategic goals includes as a top priority the fostering of "collaborations and partnerships."

With the price tag running into millions and even billions of dollars, the construction of these technological behemoths inevitably requires significant organizational, political, and financial commitment. Thus, accelerator technology is a principal factor in the formation of collaborations in high-energy physics: at the price, not every physics department can have one. Scientists hoping to do significant experimental work in the area of high-energy physics, however, need to gain access and to participate in accelerator-centred projects. Moreover, the particular configuration or sociological character of each collaboration depends upon a variety of factors, including personal friendships, the scale of the experiment, as well as the requirement of large numbers of participants or particular kinds of expertise.

As an organizational type or species, the multi-institutional collaboration is interesting because it does not resemble the conventional picture of organizations that archivists have encountered in the past. Multi-institutional collaborations as a form of organization of scientific effort do not neatly coincide with the usual institution or agency structure. Collaborative organizations, this study points out, lack the relative structural permanence of most agencies and organizations upon which archival methods and practices are often predicated. In addition, authority structures may not be as clearly articulated, or at least conform to more traditional distributions of organizational authority. Administrative continuity, another character-

istic of organizations that is familiar to archivists, is not obvious in these types of organizations. Rather, the hallmark of these scientific collaborations is their transience. Finally, Peter Galison's historical analysis for the study explains that such arrangements manifest an interesting and peculiar organizational dynamic, particularly with respect to the process of negotiation and reconciliation engendered by sometimes divergent individual, institutional, accelerator management, and collaboration interests and priorities.

The archival research for the study involved the creation of a database ("Census") of all high-energy physics experiments between 1973 and 1987. Site visits and interviews were conducted with scientists, administrators, managers, and records staff to accumulate data. A standard questionnaire was developed and the interviews were recorded on tape. After the completion of the recorded interviews, the data underwent archival, historical, and sociological analyses to determine the nature, organization, and location of the experimental work and the documentation.

With specific experiments identified as a key activity around which high-energy physicists have often coalesced, the study selected for detailed attention from its larger census a number of experiments conducted between 1973 and 1987 at five of the world's leading accelerator laboratories.[2] The criteria of choice were both scientific (detector types, beam dump, a rare process, a "crucial test" of a theory, a result contrary to current theory, a non-accelerator experiment, high transverse momentum, start-up of an instrument, start-up of an electronic facility, and a precision experiment) and sociological (size of collaboration, duration, the site, possible uses of sub-contracting).

The ASMIC study results are published in five separate reports (of which I only had access to the first four). Report No. 1 contains a summary of the project activities, findings, and recommendations; Report No. 2 is titled "Documenting Collaborations in High-Energy Physics"; Report No. 3 is a "Catalog of Selected Historical Materials"; Report No. 4 is "Historical Findings on Collaborations in High-Energy Physics"; and the last is "Sociological Analysis of Collaborations in High-Energy Physics." Though all the reports together constitute an exemplar of archival appraisal/documentation methodology, the first two reports are perhaps key for archivists, as they contain the project's archival analysis, appraisal guidelines, as well as its major recommendations. One of the most interesting findings is that it is collaboration *spokespersons* who usually possess the most important documentation relating to particular collaborations. For the purposes of documenting vital experiments, it was found that the correspondence files of individual participant scientists as well as experiment log books and internal collaboration memoranda offer important sources of information. The Working Group also generated a set of priorities for retention of records for all experiments: Physicists' Advisory Committee records; laboratory directors' files; proposals to laboratories; Memoranda of Understanding (contracts); blueprints of detectors and their components; proposals, including narrative and financial progress; and final reports to funding agencies.

This study embodies two of the most prominent contemporary approaches to archival acquisition, namely documentation strategy and macroappraisal. This dual approach is evident in the guiding purpose of the study. One of its premises, one of

its prime concerns, is to document a specific type of human activity, high-energy physics, *regardless of what the institutional or organizational arrangements under which that subject or activity (research) happens to have been undertaken.* On the other hand, in accordance with macroappraisal, the study also maintains the more traditional archival focus on the structural-functional features of the more permanent organizations that are implicated in these temporary collaborations. This two-pronged approach is eminently sensible, combining the virtues of both without permitting the perspective of one or the other to unduly inhibit the team's conception of the universe of human activity it is trying to document. Impressive and ambitious in scale, this project, in all its phases, will be a boon not only to archivists dealing with the specific problem of documenting high-energy physics and the other sciences it is projected to cover, but also to archivists whose responsibilities relate to other science and science-related activities. Its data collecting methodologies as well as the research approach and the expertise brought to bear on the problem is enviable. Unfortunatey, it is questionable whether the wherewithal exists to put together regularly such a team of resources to meet the research standard set by this project.[3] Nevertheless, the study offers a model for organizing, managing, and conducting archival research and decision-making to which all archivists can aspire.

It is of more than passing interest that the ASMIC study itself constitutes a multi-institutional, multi-disciplinary collaboration of sorts. Headed by project director Joan Warnow-Blewett, archivist at the sponsoring American Institute of Physics, the project drew on a wide-range of talent from different institutions and disciplines, including prominent historians and sociologists of science; scientists, engineers, and science administrators; and archivists and archival administrators. The study was guided by an Advisory Committee created to support a smaller Working Group made up of individuals from the above disciplines who designed the project, developed appropriate methodologies and research instruments, and also reviewed findings and made recommendations.

Multi-institutional collaborations may be the wave of the future not only in science but in other fields of endeavour . Some of the same factors that have induced scientists and scientific institutions to organize along multi-institutional lines will undoubtedly impel areas outside science to follow suit (including, evidently, archival practice). This study's admirably eclectic approach may find archival applications outside the field of scientific research.

Notes

1 Of course, the international commerce in scientific knowledge, as some historians have pointed out, can be traced back at least to the seventeenth century.

2 These are the Brookhaven National Laboratory; Cornell Electronic Storage Ring; Stanford Linear Accelerator Center; European Centre of Nuclear Research (Centre européen de recherche nucléaire), and the Fermi National Accelerator Laboratory.

3 The United States National Archives and Records Administration has recently embarked on a multi-disciplinary study involving the appraisal and acquisition of scientific and environmental databases that matches the AIP study in scale.

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