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Preserving Documentary Materials for the History of 20th Century Physics

1. Introduction

I am what is called in the United States an " activist archivist ". We don't just sit in our libraries waiting for donors to send us their papers; we go out into the field and play an active role in deciding what documentation should be saved. I've been working at the job of saving modern physics records for 20 years. More and more I see the importance of going out to the physics laboratories and, in general, trying to understand physicists and what they do. In fact, last year I actually married a physicist! All of this means I am something of an enthusiast, so you can imagine how delighted I am to be here to take part in your discussions about documenting modern Italian physics.

I shall spend my time with you today describing some of the experiences of our Center for History of Physics at the American Institute of Physics in New York: our beginnings, our philosophies, and some of the strategies we have used to document modern physics and astronomy. I would not want my remarks to be viewed as statements of an evangelist proposing what you in Italy should do if your documentation is to be saved, any more than I would recommend that everyone should marry a physicist. But I do hope that by sharing some of our experiences — some of the things that have worked for us — I can suggest approaches that may work for you.

I should remind you at the outset that the American Institute of Physics (AIP) is a coordinating organization of the leading American societies in the fields of physics and astronomy. As such, the AIP represents some 60,000 scientists. Its principal activity is publishing.

Traditionally, individuals and institutions who occupy center stage in world events rest assured of a place in history; their letters and other documents would be dutifully cared for, and historians would make certain that their contributions were entered as accurately as possible in biographies and histories. The most important scientists of the past were included in this tradition: Galileo, Newton, Franklin, Faraday — just to name a few. A casual observer of America

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in the 1930s might have concluded that the situation for documenting science was, if anything, improving. After all, historians of science and archivists were both established enough by then to have formed their own specialized societies and, since science in the 20th century was so clearly of central importance, the casual observer could expect that it would claim the attention of both the historians and the archivists. Such was not the case — quite the contrary. It took some decades before the extent of the disaster began to emerge.

It was in the late 1950s that a few individuals began to be concerned that the great contributions of 20th century physics were not widely appreciated and that the documentary source materials needed for that understanding were not being saved. These individuals were not historians of science; they were not archivists; they were leaders in the American physics community: in particular, Elmer Hutchisson, then director of the AIP, and John Wheeler, then of Princeton University. Hutchisson's prime interest was in starting an effort to document modern physics in the US, while Wheeler's focus was saving the records and the recollections of the great figures in quantum physics. Hutchisson and Wheeler took the lead: they galvanized the support of distinguished physicists, they used their reputations to get grant money from the National Science Foundation for this *awkward* kind of activity, and they attracted a few young American physicists to help with the planning and to carry out much of the work. These young physicists, although they were not trained as historians, were the only people doing serious historical work in modern physics. It won't take a minute to tell you who they were: Paul Forman, John Heilbron, Gerald Holton, Martin Klein, and Thomas Kuhn.

I have deliberately mentioned names, because I want to emphasize the point that getting a documentation program started is no different from any other truly new effort, whether in the world of physics, international politics, or other field. It requires commitment, optimism, and action on the part of a few dedicated individuals.

I have merged the story of two different but complementary projects, because I want to emphasize the importance of cooperation. Two proposals were submitted by the AIP to the National Science Foundation in 1960. One would lead to the AIP Center for History of Physics and the second would result in the highly successful History of Quantum Physics project. From the outset, the two programs worked closely together and supported each other; membership of their advisory committees overlapped. I need deal no further with the Quantum Physics project: Spencer Weart spoke of it in his paper and I expect that the project's microfilm and oral history archives in Rome are well known to you. I will now focus on the national program to document modern American physics, which is of more immediate interest here. If we go back to the beginning, I think you will find that some of the circumstances we faced in the US are familiar to you here in Italy.

The first thing Hutchisson did, back in 1959, was to set up a Committee, with Gerald Holton of Harvard as chairman, to investigate the situation and

recommend an appropriate role for the AIP. The Committee found an entirely bleak situation:

1) Physicists thought their publications offered sufficient record, and ignored or destroyed their manuscript materials;

2) Archival programs, where they existed, avoided dealing with papers of modern scientists;

3) Only a handful of individuals were working on the history of modern physics; they were, without exception, trained as physicists.

The Committee stated categorically that, unless immediate and drastic action was taken, the documentation of modern physics would be lost. By year's end, the Committee had drafted a plan of action and Hutchisson had been authorized by the AIP Governing Board to act on it.

Please bear in mind that this group of physicists had to work from scratch; there were no existing programs to serve as a satisfactory model. Hence, that first plan of action was remarkable. It included shrewd and practical documentation strategies and, even more important, it stated or implied philosophical principles. Looking back at these documents and recalling my earliest years at the Center, I can see that just a few basic principles have governed all of the Center's programs from the beginning. Altogether, there are six commandments:

1) *Keep close contacts with the community you wish to document.* For us, this means physicists and astronomers; more specifically — during special projects — astrophysicists, nuclear physicists, solid state physicists, and so forth. As I said earlier, this principle directs us to get out of our library, keep our finger on the pulse of the way physics gets done, and talk with individual physicists about the records they produce and why some of them should be saved. This becomes even more important when people trained as historians and archivists carry out the work.

2) *Keep your programs visible to the communities you serve.* These are educational activities directed toward physicists (to remind them of the value of history), toward historians and other scholars (to attract them to new areas of research), and toward archivists (to interest them in saving the important records of physics and astronomy). Spencer Weart's paper earlier this week spoke of some of our special educational projects. The ammunition we use daily may be even more important: our Center *Newsletter*, brochures about the Center and its Niels Bohr Library, a booklet for scientists and archivists offering guidelines for identifying records of historical value, and a variety of catalogs of manuscript collections. (See Appendix).

3) *Assist and cooperate with related programs.* It takes valuable time to persuade scientific institutions to start archival programs, help other disciplines get Centers started, support related history projects, and assist archivists who

are taking more and more responsibility for saving the documentation of modern science and technology. That valuable time is well-spent. After being isolated for so many years, it is gratifying now for the AIP Center to have sibling history centers in areas like chemistry and computers, and also archives and individual science archivists, to share the work and teach us a thing or two.

4) *Draw on expert advisors as needed.* The obvious point here is the need for an ongoing advisory committee of distinguished physicists and historians to guide program activities and to argue for your existence when economic difficulties arise. But there is another side to the coin. Americans have a saying that applies here: " Don't re-invent the wheel ". Call on the experts. If you want to know whether a certain kind of record is valuable to a historian of economics or a sociologist, or if you want to know how to use computers to automate your manuscript catalogs, don't waste your own time. Call on the experts who have spent years of their time figuring it all out. May I add, if you need to consult a science archivist, please feel free to call on me.

Now, for the last two commandments. In my opinion, these are especially important to national documentation programs, because they cover areas of temptation — areas where we must be particularly alert if we want to succeed.

5) *Focus your energies on those activities you can do better than another institution.* This point is clearer when put in the negative: do *not* do what others should, and could, do.

6) *Develop documentation goals and strategies* keeping in mind the knowledge you have of your physics community and the big picture — national, but at times international — of what you want to accomplish.

I can illustrate the way these basic philosophical tenets govern all of the Center's programs by discussing the strategies we employ to document modern physics.

A documentation strategy is a structured plan to save those papers and records that are essential for an accurate understanding of a subject. You must define your topic, chronological period, geographical boundaries, and identify the individuals, institutions, issues and events that should be documented. And you should, of course, have a clear understanding of the purposes for saving the documentation. Ideally, documentation strategies should be designed and carried out as a cooperative effort of the scientists who create the records along with archivists and historians and other potential users of the records. Back in 1960, the AIP Center had only physicists to design documentation strategies, but these physicists understood the value of taking archivists and future historians into consideration.

Of necessity, the AIP's first plan of action was very large in scope: to document all important physics done in America between 1890 and 1940. Using historical research and drawing on the first-hand knowledge of distinguished physicists, we identified institutions — particularly academic and

industrial — that had made major contributions to physics during the period. A survey was made of the industrial laboratories to see what, if any, historical documentation was available; overall, the findings were dismal. Another survey, of academic physics departments, proved more fruitful. The question: "Do you have, or will you write a history of your department?" resulted, over the years, in scores of manuscript histories of academic physics departments.

The single most important strategy from the Center's founding years was the one designed to save papers of individuals. To identify the "most productive" American physicists, a number of criteria were developed. These included honors, elected office, number of papers published in the *Physical Review*, and so forth. The result was a list of 1200 — not so large a number considering the many thousands they were culled from. Nevertheless, it was abundantly clear that the task of taking in all of their papers could not be done at the AIP Headquarters; I'll talk in a minute about the ways we dealt with the problem of where to save papers.

When we wrote to our 1200 physicists (or, if they were no longer alive, to their families and colleagues), we did not offer the AIP as a repository for their papers. We did try to persuade them that their letters and other manuscript materials should be saved and we enclosed our booklet full of arguments as to why certain kinds of documents were particularly useful to historians. And, we offered to help make arrangements with an appropriate library or repository for their papers.

What did we ask these physicists or their families to send to us at the AIP? First and foremost, we wanted information about any papers they did have; the Center maintains a complete file about the location and contents of manuscript collections in an "International Catalog of Sources for History of Physics". We also asked our physicists to send us bibliographies, annotated reprints, and photographs and — from a few — we requested that they write autobiographies for our files.

Where should papers of distinguisged scientists be saved? Ideally, they should be in an archival repository at the institution where the scientist in question spent most of his career. Some physicists, of course, spend important periods of their careers at different institutions; this makes matters more complicated, but doesn't alter the ideal. For example, Fred Seitz's papers from his years at the University of Illinois are there in the University Archives; those for his tenure as President of the National Academy of Sciences are at the Academy Archives; and, likewise, his records as President of Rockefeller University are at the Rockefeller Archives. This is as it should be even though such arrangements may be difficult, if not virtually impossible, to make — particularly toward the end of a person's career.

There are a number of reasons for trying to keep a scientist's papers where he worked; for example, the value to the home institution of having its own history intact. But the reason I want to stress here is that it reflects more accurately the way science is done. Physicists typically work with colleagues, they

report to department chairmen or perhaps to the head of their institution, they participate in the budget process, and serve on institutional committees. The best way to understand the career of one physicist is to use his papers in conjunction with those of his colleagues and with the records of institutional offices and groups. Whenever possible, then, the AIP Center tries to keep physicists' papers at their home institutions. The achievement of this goal is another matter.

As a matter of fact, back in the early 1960s, the problem of simply saving important papers from destruction seemed almost insurmountable. Remember that, even where archival programs did exist, the archivists had managed to avoid papers of modern scientists. (It may amuse you to know that in 1961 the only papers of a 20th century physical scientist reported to be in an American repository were those of Enrico Fermi at the University of Chicago). Let me reconstruct what our Center staff and advisors did back in the early 1960s, as they tackled the severe problem of finding homes for papers. They reviewed our list of 1200 physicists and realized that most of them (about 70 percent) were academic physicists. Most of these academics were clustered around just a few institutions: 8 or 10 in number. It was soon clear that if these few academic institutions could be persuaded to save the papers of their distinguished physicists, then half of the Center's problems in documenting physics up to the World War II period would be solved.

Three universities were receptive immediately: the University of Chicago (thanks, perhaps, to the Fermi experience), the University of Illinois, and Cornell University. The rest required more work, but we found an effective tactic. Here you will see how strategic it was of the Center to overcome the temptation to collect at the AIP the papers of the ten or fifty most famous American physicists. It was these few collections that would be the cards up our sleeves: the gems we could dangle to argue, cajole, or shame academic institutions into saving papers of their own physicists.

Harvard exemplifies the universities that had archival programs but no papers of modern scientists. When the Center located cartons of papers of the eminent astronomer, Harlow Shapley, we offered them to Harvard, his home institution. At the time, Harvard said, " No, not unless the papers come to us cataloged ". Well, we did the cataloging and the papers went to Harvard. I think that incident helped change some of the thinking at the Harvard University Archives. Before long, they hired a special curator for science manuscripts; their holdings are now a rich resource for historians of science and other scholars.

Two of the key academic institutions had no archival programs whatsoever: CalTech and MIT. I still remember Charles Weiner, the Center's director from 1964 to 1974, making an early trip to CalTech. He found the papers of the great Robert Millikan buried in a basement. He took the story to CalTech officials and shamed them into starting an archival program. I'm sure some of you know the CalTech Archivist, Judith Goodstein, because of her interest in Levi-Civita and other modern Italian scientists.

For some reason, MIT resisted starting an archival program. Every time the AIP Center had to find a repository for an MIT physicist, we brought the situation to the attention of officials at MIT, reminding them that — until they had their own archives program — they would continue to lose the papers of their important physicists to other repositories. These exchanges probably softened things up, but a dramatic turnaround came when the Center deliberately held a meeting of its own advisory committee at MIT to discuss the issue with a few key faculty and administrators. These individuals were receptive to the arguments that an archives program was a responsibility of the Institute and that it would serve the Institute's interests as well. Today the MIT Archives has one of the most outstanding programs in the country. A great deal of the documentation of its own history and of physics at MIT is being saved.

Despite these success stories, the ideal of placing physicists' papers at their home institutions has not always been realized. From its very beginning, the Center has had to employ other solutions to save endangered papers. In most instances, we turn to repositories that collect documentation on a national, regional, or subject basis — such as the American Philosophical Society Library, the Bancroft Library at Berkeley, the Library of Congress, and the Smithsonian Institution. The Center encourages the initiation of new collecting programs to preserve "homeless" science collections.

Those of you who have visited our AIP Center know that we have records and papers in our own Niels Bohr Library. The Center serves as the repository for the records of the AIP and its Member Societies. The Center does not normally collect papers of individual physicists. It does have some, usually because the physicist's home institution lacks an archival program. The AIP's policy toward such papers differs from the collecting repositories I just mentioned. We stand prepared to send any relevant papers we have back to their home institution once an archival program has been initiated there. Indeed, we have found that this promise of returning collections is a useful tool for stimulating the creation of new archival programs.

The Center's oral history program has already been briefly discussed at this meeting by Spencer Weart. I simply want to emphasize here that oral history interviewing has been an important element in our efforts to document modern physics. When carefully prepared, these tape-recorded recollections provide a vital supplement to the written record. At the present time, the Center has interviews with well over 500 physicists. This rich resource grows in three ways: first, we conduct interviews as part of our special studies of subfields of physics. Second, we provide support to the oral history work of other projects related to physics, such as the current Laser History Project. And third, we provide some financial support to selected historians doing interviews for their own research programs. Overall, the Center's oral history program is structured to be consistent with its basic principles of encouraging others to do what they can do best and taking on itself those activities appropriate to a national discipline center.

What I have described thus far are our earliest documentation strategies and the ways these have been governed by our six commandments. In principle, little has changed. It is true that we have found it more efficient to focus on subfields of physics, but the strategies involve the same kind of analysis: identification of topic, chronological period, geographical boundaries, and the principal institutions, individuals, issues and events to be documented. In our project letters — or those letters I write when we learn that papers might be endangered because of death, retirement, or relocation — the message is still the same: " Don't destroy the papers; let us help you select an appropriate repository ". Happily, there are now many repositories accepting or collecting papers of modern physicists.

But there have been changes in our documentation strategies. These have come primarily from changes in the physics community itself. In the early 1970s, when the AIP Center turned its attention to the documentation of postwar physics, it found almost everything was different and problematical. Much of the important physics had shifted away from academia with its archival traditions to industry and, in particular, to federally funded research and development laboratories where records managers held sway. Whereas research in the prewar period was done by one, two, and occasionally three people, the Center found that research was now far more likely to be done by large teams. Another point was that the records themselves had changed. Correspondence, once the mainstay for the historian, was now likely to cover only routine matters. Meanwhile, there were entirely new types of records; the product of one experiment was apt to be 1,000 reels of magnetic tape rather than one notebook.

If the AIP Center lacked expertise in dealing with this contemporary records situation, it soon found that no one else knew how to deal with the problems. At the same time, we felt a great sense of urgency, because we found that the records were literally in danger. In fact, it was the job of the records managers (the only people dealing with the files) to get rid of the records as soon as possible. There was not a single archivist at these nonacademic research laboratories to offer any protection to the documentation.

The result of our preliminary findings was an AIP project; we call it our Department of Energy or " DOE " study. The DOE study was designed to find answers to our many questions about post World War II physics and to develop recommendations for improving the identification and preservation of valuable documentation. The design and supervision of this study absorbed me for well over five years and I regret that my remarks here must be so limited. (However, two of the project's reports are listed in the Appendix). Let me make just a few points about the project that seem most pertinent to my topic today.

The main purpose of our DOE study was to become familiar with an area of physics that seemed strange to us. We knew about prewar academic physics; now we must learn about postwar nonacademic physics. We decided that instead of spreading ourselves thin, at say 20 laboratories, we would focus on just four;

project field workers spent over eight man-years working on site at these laboratories. As in our other documentation strategies, we picked our targets carefully: four of the Department of Energy's National Laboratories (Argonne, Berkeley, Brookhaven and Oak Ridge). Once at the labs, we worked closely with physicists and administrators and did the historical research necessary to identify the key people, offices, and committees and the major institutional and scientific events.

When we had a reasonably clear picture of what was important, we went looking for the records that would be most valuable in documenting the key people, groups, instruments and events. In our efforts to appraise records — that is, to determine the very small fraction that should be saved for historical purposes — we called on experts for assistance. Without doubt, the most important experts were the physicists and administrators who had created the records. In addition, I assembled a group of advisors who worked very hard on our behalf. Seven of our advisors represented academic disciplines ranging from history of economics to sociology of science; they reviewed files of laboratory records, studied our field reports, and spent hours in committee meetings arguing (in a most cordial and lively fashion) about the kinds of laboratory records that would be most useful to practitioners of their academic disciplines. From the solid field work and the advice of the scientists and scholars, the project was able to produce the first set of guidelines for appraising postwar science documentation.

The DOE project has had several benefits. For one thing, there is now a movement among Department of Energy laboratories and elsewhere to initiate archival programs in order to take better care of their own records. Another, centrally important, benefit to us at the AIP is that the project gave us a familiarity with postwar physics. This has made it possible for us to encourage research laboratories to start archival programs and to give them knowledgeable advice on how to proceed when they are ready. Finally, it is heartening to see that a small but growing number of historians are beginning to use the new records. This is, of course, the purpose of a documentation program: to save and to use the records for a more accurate understanding that benefits all of us.

Finally, there is a question that a discipline center must address: what kinds of materials should it collect for itself? In answering that question, the AIP Center has to deal with the realities of limited space and funding. But we also feel we have a responsibility in cases where we really are the best place for materials to be saved. Here are some examples of our holdings. We preserve the records of the AIP and its Member Societies as well as endangered papers of physicists, at least until a better home is found for them. We create documentation, primarily through oral histories, but also by tape recording eye-witness accounts given by physicists at retirements, memorial sessions, and other historical programs. We request and receive manuscript autobiographical and institutional histories. We collect some materials simply to make them more accessible; the most popular example of this is our collection of historical photo-

graphs. We now have close to 18,000 photophraphs of physicists, a resource well-known to physicists, historians, book editors, and TV producers.

Perhaps the most important thing we collect is information about the location and content of manuscripts documenting modern physics and astronomy. Once national in scope, this catalog is now international in its coverage, a most welcome sign that efforts to save modern physics documentation are spreading. Remember that, back in 1961, only Fermi's papers were known to be safely preserved in an American repository. Today, at the AIP Center alone, we have information on the manuscripts of approximately 2500 physicists in repositories around the world.

In closing, I would like to return to our fundamental commandments which have served the AIP Center so well and which, in my opinion, are cogent to other documentation programs:

1) *Keep close contact with the community you wish to document.* Keep your finger on the pulse of the way physics gets done, and talk with individual physicists about the records they produce and why some of them should be saved.

2) *Keep your programs visible to the communities you serve.* Direct brochures, newsletters, catalogs and other materials toward physicists, historians and archivists to foster the preservation and use of modern physics documentation.

3) *Assist and cooperate with related programs.*

4) *Draw on expert advisors as needed.*

The last two commandments I think are particularly important to national documentation programs:

5) *Focus your energies on those activities you can do better than another institution.* In other words, try *not* to do what other institutions should and could do. And,

6) *Develop documentation goals and strategies.* Keep in mind the knowledge you have of your physics community and the big picture — national, but at times international — of what you want to accomplish.

I hope my resume of some of the Center's activities and the philosophical principles guiding our efforts are of some use to you as you discuss possible means and methods to safeguard the documentation of modern Italian physics. Our best wishes to you!

APPENDIX

1. Selected Publications of the AIP Center for History of Physics

– *Center for History of Physics, American Institute of Physics.* A brochure on the Center's purposes and programs.

– *Resources of the Niels Bohr Library*, Center for History of Physics, American Institute of Physics. A brochure describing the Library's collections of published, manuscript, and audio-visual materials.

– *Scientific Source Materials: A Note on Their Preservation.* A brochure for scientists and archivists describing the types of source materials historians find most useful.

– *Newsletter of the AIP Center for History of Physics.* Reports on manuscript collections around the world, AIP Center activities, and journal articles. Issued twice a year.

2. Reports on Archival Research

– Haas, Joan, Helen Samuels, and Barbara Simmons, *Appraisal Process for Scientific and Technical Records*, Massachusetts Institute of Technology Cambridge, Mass; in preparation.

– *Understanding Progress as Process*, adited by Clark A. Elliott. The final report of the Joint Committee on Archives of Science and Technology. Introduction by Joan N. Warnow. 1983 publication distributed by the Society of American Archivists, 600 South Federal Street, Suite 504, Chicago, Illinois 60605.

– Warnow, Joan N. and the AIP Advisory Committee on the Documentation of Postwar Science, *Appraisal Guidelines: Selection of Permanent Records of Department of Energy Laboratory Management and Policy and Physics Research*, American Institute of Physics, New York 1982.

– Warnow, Joan N. et al, *A Study of Preservation of Documents at Department of Energy Laboratories*, The final report of the AIP study of Department of Energy National Laboratories, American Institute of Physics, New York 1982.

– Weart, Spencer R., "Putting the Past to Work". *Research Management*, Vol. XXV, No. 2 (March 1982), pp. 22–25.

3. Archival Catalogs

Published by the American Institute of Physics:

– National Catalog of Sources for History of Physics — Report No. 1. *A Selection of Manuscript Collections at American Repositories*, prepared by Joan Nelson Warnow, American Institute of Physics, New York 1969. Reprinted 1971. Out of print; loan copies are available.

– National Catalog of Sources for History of Physics — Report No. 2. "Source Materials for the Recent History of Astronomy and Astrophysics: A Checklist of Manuscript Collections in the United States", prepared by Charles Weiner and Joan N. Warnow. Reprinted from *Journal for the History of Astronomy* (1971).

– National Catalog of Sources for History of Physics — Report No. 3. *Rutherford Correspondence Catalog*, compiled by Lawrence Badash, American Institute of Physics, New York 1974. This catalog of all Lord Rutherford's correspondence at Cambridge University Library and at other repositories was published to serve as a supplement to the Sources for History of Quantum Physics catalog.

– National Catalog of Sources for History of Physics — Report No. 4. *Guide to The Robert Andrews Millikan Collection at the California Institute of Technology*, by Albert F. Gunns and Judith R. Goodstein, American Institute of Physics, New York 1975.

– National Catalog of Sources for History of Physics — Report No. 5. *Preliminary Finding Aid to the Archives of the Lick Observatory*, from the card catalog maintained by the Lick Observatory Archives staff, University of California at Santa Cruz, American Institute of Physics, New York 1980.

– International Catalog of Sources for History of Physics — Report No. 6. *Sources for History of Physics at Department of Energy National Laboratories: Argonne, Brookhaven, Lawrence Berkeley, and Oak Ridge*, prepared by Joan N. Warnow, Allan Needell, and Jane Wolff. In preparation.

– International Catalog of Sources for History of Physics — Report No. 7. *International Catalog of Sources for History of Solid State Physics*, compiled by Joan N. Warnow. In preparation.

– International Catalog of Sources for History of Physics — Report No. 8. *Manuscript Source Materials in the Niels Bohr Library of the American Institute of Physics*. In preparation.

A Selection of Other Catalogs:

– Contemporary Scientific Archives Centre. *Catalogues Compiled by the Contemporary Scientific Archives Centre*, edited by Jeannine Alton, Oxford Microform Publications Ltd., Oxford 1979. Supplements, 1981.

– *Guide to the Records Relating to Science and Technology in the British Public Record Office: A RAMP Study*, prepared by Michael Jubb. United Nations Educational, Scientific and Cultural Organization, Paris 1984.

– Kuhn, Thomas S. et al, *Sources for History of Quantum Physics: An Inventory and Report*, The American Philosophical Society, Philadelphia 1967.

– MacLeod, Roy M. and Friday, James R., *Archives of British Men of Science*, Mansell Information/Publishing Ltd., London 1972.

– *The Manuscript Papers of British Scientists*, 1600–1940, issued by The Royal Commission on Historical Manuscripts, Her Majesty's Stationery Office, London 1982.

– Massachussetts Institute of Technology, *Selective Guide to the Collections in the Institute Archives and Special Collections, M.I.T. Libraries*, Preface by Helen Slotkin [Samuels], Massachusetts Institute of Technology, Cambridge, Mass. 1981.