CHEMICAL HERITAGE FOUNDATION

A. J. MEADOWS

Transcript of an Interview
Conducted by

W. Boyd Rayward

at

Loughborough University
United Kingdom

on

29 June 2000

(With Subsequent Corrections and Additions)

CHEMICAL HERITAGE FOUNDATION
Oral History Program
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A. J. MEADOWS

1934 Born in Sheffield, Yorkshire on 24 January

Education

1957 B.S., physics, Oxford University
1959 M.S., physics, Oxford University
1959 Ph.D., astronomy, Oxford University
1965 M.Sc., history and philosophy of science, University College London

Professional Experience

1965-1986 University of Leicester
1971-1986 Professor, history of science and astronomy

Loughborough University
1986-2001 Professor, information science department

Honors

1996 Hon. D.Sc., City University London
1996 Permanent Vice-President, Library Association

ABSTRACT

A. J. Meadows begins the interview with a discussion of his early employment at the University of Illinois. He reveals why he studied both astronomy and the history of science, and how, through his knowledge of both those subjects, he was appointed to those departments simultaneously at the University of Leicester. Next, Meadows discusses his initial interest in information science, which led him to establish two centers for communication studies. Further, he details particular studies undertaken at those centers, and the results. Then, Meadows discusses his various relationships with the Institute for Information Scientists [IIS], the Library Association [LA], and Aslib. He details the merger between the IIS and the LA, and the significance of Aslib's research department. Subsequently, Meadows discusses online communication's impact on information science, and *vice versa*. As examples, he explains the creation and growth of BioMedNet and the e-print system. Also, Meadows describes his relationship with Donald J. Urquhart. In conclusion, Meadows talks about the various peaks of information science, and ponders the definition of the words "information," "documentation," and "library."

INTERVIEWER

W. Boyd Rayward is a research professor in the Graduate School of Library and Information Science at the University of Illinois, Urbana-Chamapaign. He turned to librarianship after graduating in English literature from the University of Sydney. He received his Ph.D. from the Graduate Library School at the University of Chicago in 1973. He has held positions in the University of Chicago (where he became Dean of the Graduate Library School). He served as Professor and Head of the School of Information Library and Archive Studies and Dean of the University's Faculty of Professional Studies at the University of New South Wales in Sydney where he is now professor emeritus. He has published two books related to Paul Otlet, Belgian documentalist and internationalist, and a great many articles on history of national and international schemes for the organization and dissemination of information.

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LOCATION: Loughborough University
United Kingdom

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RAYWARD: Jack, you were saying that your first job was at [University of] Illinois. I had no idea.

MEADOWS: Yes. I spent a year and a half at Illinois and the rest of the time at Caltech [California Institute of Technology].

RAYWARD: When did your interests shift from astronomy to the history of science?

MEADOWS: As I remember, I went back to [University of] St. Andrews to lecture in astronomy. However, I had become very interested in the history of science while I was at Oxford [University]. I studied physics at Oxford, and, in fact, was awarded one of the History of Science Prizes. I wrote about a bloke named [James Prescott] Joule; you may or may not have come across him. Joule's name is commemorated nowadays in physics, you know—this or that has so many joules.

Anyway, I decided to earn some qualification in the history of science, and the best place in the country at that time was University College London [UCL]. By that time, I was married and had a family, and so I had to have a job to support them. There was an interesting advert for a job enhancing the science collection at the British Museum, in the department of printed books and manuscripts. So I got that job, and I took the qualification in history and philosophy of science part-time at UCL. As you may remember, UCL is a five-minute walk from the British Museum. Then, just as I was finishing my studies, the University of Leicester offered two posts: one to establish an astronomy program and another to develop their history of science program. So I applied for both of them, effectively, and they gave me both of them.

So I continued to work in both astronomy and the history of science in parallel. But at the same time, my work at the British Museum had interested me greatly in communication. It was while at the British Museum that I first met Derek [J.] Price in the 1960s. He had just published *Little Science, Big Science* a year or so before I met him (1). And, you know, I thought, "This is a fascinating way of looking at things." So, I got some money at Leicester to

set up a couple of centers for communication studies. Hence, I worked in astronomy, the history of science, and on the communication studies centers in parallel for 20 years. Then I got an invitation to take over the information science department at Loughborough [University], and I thought, "A change might be fun."

RAYWARD: How long were you at Leicester?

MEADOWS: For about 20 years.

RAYWARD: Jack, aren't you forgetting another movement here regarding information science? You were one of the first people interested in the study of information science as a discipline, such as your interest in the development of information systems.

MEADOWS: That was the communication part, you see? I extrapolated this little bit: Derek Price argued that the growth rate of publication couldn't be maintained into the indefinite future because it would exceed the growth rate of the people producing the publications. So the obvious question to ask oneself was, "What does that imply?" I thought his argument implied publication would have to be handled differently in the future—that it would have to go down a different route. Further, it seemed to me that computers would have a major impact on communication. So I became interested in the impact of computers on communication, and more particularly, on the communication of research and all its outlets. I mean, publication followed a traditional path; from the author, to the publisher, to a library, and then to the reader. Of course, that path changes with time. I was very interested in the future change in communication methods and its impact on all those people who operated in the traditional communication chain. It seems that question impinges greatly on information science.

RAYWARD: How did you undertake all of the necessary studies, and what were your findings at the time?

MEADOWS: First question. It struck me that the easiest and most interesting way to focus those studies was to concentrate upon research publications and, more particularly, those that had importance in higher education. I had two reasons to take such an approach: first of all, your colleagues are duty-bound to respond to questions you ask them. Secondly, universities are the only place I know where all subject areas work in roughly the same way—you know, all are funded together, and all communicate by similar methods at least. For instance, you won't find very many historians who communicate if you go out into industry. So that's why I chose to concentrate on communication that related to universities: university publishing in the widest possible sense. What was your second question again?

RAYWARD: Were you at all in contact with the people studying the communication in science—I think it was psychology, actually—over at Drexel University, I think it was?

MEADOWS: Yes. In fact, I've just written a piece for—what's his name?—that nice ginger-headed chap who died (2). There's going to be a special commemorative volume of *Scientometrics* for him, and I have written an article for it.

RAYWARD: Do you mean Belver [C.] Griffith?

MEADOWS: Reminds me of Belvoir Castle—pronounced "beaver"—in Leicestershire. Yes, of course, Belver Griffith. And then there were people working on the communication flows in psychology at Johns Hopkins [University] in the 1960s. Actually, at that time there were some large-scale investigations into a number of publications, which produced some excellent results, I think. Life was a bit more leisurely then. If you wished, you could carry on an investigation for a whole decade; whereas, nowadays you are expected to have your answer in six months. That is fair enough for many things, but you tend to miss out on the big things. Anyway, there were many people doing major communications projects in the 1960s, particularly in the [United] States. I tried to make contact with most of them.

RAYWARD: Were you conducting similar studies in that center for communications? I suppose my original question was in regard to the results of those studies.

MEADOWS: It was called the Centre for Primary Communications, the idea being that it was concerned with original research activities rather than secondary literature, like abstract journals and so forth. We learned a lot of things through our studies. The work ranged over authors, publishers, libraries, and readers, all of which forms a fairly disparate bunch. For example, the readers include people in other areas, or even lay people, who are reading specialty subjects. So one of the projects looked at how history was portrayed in books that were read outside the university by non-historians. I suppose one might summarize short-termism as an overall result.

RAYWARD: What does short-termism mean in that context?

MEADOWS: It means that most of the people in the chain were not prepared to think more than six or nine months ahead, so far as communication changes were concerned. For instance, back in the 1970s and early 1980s, publishers were apathetic to my assertions that there would be a major change in communication in the future. They would say, "Perhaps; but maybe not."

They found it difficult to believe that the world could exist without their existing skills, and no doubt, the same applies to all of us! Publishers have got better since then, but short-termism was certainly one conclusion of our studies.

Another conclusion, I guess, was that people thought the world was less complicated than it was in reality. For example, we did a lot of work on quality control in literature. The overall results were not surprising, in the sense that underlying beliefs were fairly permanent. Everyone said quality control was important, but when we examined the mechanisms of quality control closely, we realized that the process was cyclical. For instance, people wanted to publish in important outlets because an important outlet indicated you had published important research. Moreover, important outlets were often refereed outlets, and therefore refereeing indicated an important outlet. However, some important outlets were not refereed, or they were refereed by the editor or someone similar. But that fact didn't worry anyone so long as the outlet was recognized as being important. In the end, one got the feeling that refereeing was important, but not for the reasons that most people thought originally. So this was the kind of result that our studies uncovered: namely, that one's immediate assumptions about a situation sometimes had to be looked at in greater depth.

One obvious problem was that some of the publications' editors did all of the refereeing themselves. Such practices contradicted the purpose of refereeing by disregarding the need for an expert in the subject to referee the article properly. And the there were some outfits, like the National Academy of Sciences [NAS], where things were so flexible that the NAS fellows were expected to referee their own papers. Consequently, papers submitted by NAS fellows were generally printed.

RAYWARD: As if the fellowship itself was the criterion of quality.

MEADOWS: Precisely; it was the guarantee. My personal feeling is that the concentration on rigorous refereeing is somewhat diverting the attention from what people actually want. The famous example is the e-print system that was set up for nuclear physics papers initially, and now encompasses the whole of physics. The system is entirely un-refereed, and yet, through conversations with people, particularly theoreticians, one knows they are using it as their first line of reading. It works in this field. When someone publishes rubbish, his or her work becomes known and they won't get a job as a consequence.

RAYWARD: So there is a soft-selection process, in a sense.

MEADOWS: Yes. Certainly in nuclear physics, where e-print started, everyone is a member of a large team, within which there is a lot of refereeing. But this internal refereeing now seems to work in other subject areas as well; though, I'm not sure that it would work in English or history.

RAYWARD: True. Were your studies focused on scientific literature primarily?

MEADOWS: They were initially, in the 1970s. By the 1980s I had become interested in communication in the humanities. As I've said, I set up two centers, one of which was the Centre for Primary Communications. The other one was established in the 1980s to study communication in the humanities, specifically because there hadn't been many communication studies in that field. So I suppose I've undertaken mostly comparative research, in which I've had the greatest interest, from the 1980s to the present day. For instance, I've studied how physicists and historians communicate among themselves differently, and more importantly, why those differences exist.

RAYWARD: Each time you've referred to an interest in a particular avenue of research, you have spoken in terms of setting up a center for its investigation. But when you say "center," I imagine some elaborate institution, like those established in the United States or Australia—something with all sorts of institutional boundaries and reporting mechanisms. However, the centers you've described suggest a structure that adapts more easily to shifting interests. Of course, I may be wrong, so would you mind discussing the centers you set up in more detail?

MEADOWS: Both of the centers I set up were small. Primary Communications employed half a dozen people, and communications in the humanities employed only three people. In a sense, the centers were set up because I was offered the money to do it. As a result, I defined the purpose and objectives of the center for the most part, while keeping in mind the desires of those who funded the centers' creation. They were fairly content to let me get on with it. The other investigators at the centers didn't know any more than I did because the subjects we were exploring were in their initial stages. So, we would investigate something, and then we'd say, "That worked, but these other developments might not work."

RAYWARD: Describe the other investigators you brought into the centers?

MEADOWS: They were a fairly mixed bunch. They were people gathered from a variety of backgrounds. For example, one laddie worked on refereeing. He had started out life as a physicist, then he took a masters degree in the sociology of science.

[BRIEF INTERRUPTION]

MEADOWS: He didn't have a background in communications as such, but he had a very useful background for studying communication amongst scientists. Indeed, he did an excellent job

looking at one of the other areas that we were concerned with, which was the take-up of results. You know, in pure science, you often don't bother about take-up of results; they get taken up as much as they deserve. But we were pulled in by the Department of Health. The Medical Research Council supported pure research, though it wasn't called pure research, and the Department of Health supported applied research. At that time, the government had decided that there was too much pure research and too little applied, so they transferred a pile of money across from the medical research grants into this applied program run by the Department. Though they were happy with the new money, but the Department had difficulty determining what to specialize in and what to do applied research on. The latter was most interesting because our investigation found that they couldn't do much in their priority research areas, in some cases, as there weren't any researchers in the field.

In fact, research had to be concentrated on topics where there were researchers. It was a chicken and egg situation, where the egg was sometimes missing. Another problem was that the practitioners knew nothing about the research the researchers had done. And so our role was to figure out how to handle that situation. It was quite interesting because there were various ways of disseminating results that had not been used.

RAYWARD: So what were the results?

MEADOWS: One of the things that came out clearly was that you had bigger problems with applied researchers, because the motivation of applied researchers is not the same as pure researchers. If you've got surplus cash, it's better to give it to the pure researchers, because they can always dream up methods of using it; whereas, an applied researcher doesn't necessarily want to get involved in the dissemination of information.

Another problem, which many others have discovered as well, concerned the way in which research was completed. It related to the interaction within the research team. You see, our goal was to determine how to disseminate the information that had already been generated. However, at a crucial stage in the research, the researchers who knew all about the project it usually took their leave. That's because you begin writing up a three-year research project nine months before the end, at which time those on the project see the research as coming to an end and apply for other jobs. Then, six months before the end, they leave. In some cases, all that's left of the research team is the project head. But the project head could devote only five percent of his or her time to the project, and so he or she doesn't know any of its details. In the end, the whole project implodes.

So the report itself leaves a lot to be desired sometimes, but there's nobody to debate or disseminate the results. So the quick answer to your question was that we suggested they should actually add on a sum of money to disseminate. We'd say, "We'll give you three months more money, during which time you've got to concentrate entirely on dissemination."

RAYWARD: That seems sensible.

MEADOWS: It worked to some extent. But they also had to pass back some of the funding to the Medical Research Council; which was spent on pure research, which nobody in the world was interested in except medical researchers.

RAYWARD: Did you help create the Institute of Information Scientists?

MEADOWS: That was before my time, at the end of the 1950s. But I certainly knew many of those involved. I was pulled into the Library Association as well, and I went to a number of things dreamed up by Aslib, especially Aslib's , research department. Aslib has undergone various transmutations, but back in the 1960s, the research department at Aslib was perhaps the main body for significant information research in this country.

RAYWARD: Was that when Leslie Wilson was the director?

MEADOWS: That's right. Peter Vickers was there, as were Alan Gilchrist, and John Martyn.

RAYWARD: So basically, all the people who had become very important parts of the landscape.

MEADOWS: Precisely. Indeed, my first meeting with Derek Price was at Aslib way back in the 1960s, when I went to visit the researchers. I was provided a focus with that meeting, so that's where I came in with Aslib initially. Then contacts spread out to the Institute and to the LA.

RAYWARD: What were you doing at Aslib, specifically?

MEADOWS: I was on the research committee, which was a small research advisory group.

RAYWARD: What was the connection with the LA?

MEADOWS: I didn't know exactly why, but they pulled me into one of their committees looking at the future of library qualifications. I was impressed by the LA, particularly in

comparison with the ALA [American Library Association]. The Library Association here has actually been pretty good. It's tried to be inclusive. And that applied when I came here [to Loughborough] and was looking at the syllabus. I think it was clear that one had to move towards more computer-based activity in the future. The only question was how to do it at the right speed, so as not to destroy the cohesion of the department. The LA helped that movement because they acknowledged that things were clearly moving towards the information side; whereas, at the same time in the States, the American Library Association was refusing to recognize information courses.

RAYWARD: Yes. Quite a division grew between the fields, which is, I think, disappearing now.

MEADOWS: Yes, it's disappearing now. But there was a stage ten to twenty years ago when it was really difficult.

RAYWARD: Are you referring to the notion of two cultures?

MEADOWS: The LA never developed in that way, you see? So we reached the current situation where the LA and the Institute are fairly well advanced with the merger. The original intent some years back was to include Aslib. The problem is that Aslib has diverged a great deal from what it was in the 1960s, and it doesn't really fit into the current information research and teaching scene.

RAYWARD: Please discuss Aslib's divergence.

MEADOWS: It's purely commercial—it's a commercial organization designed to assist industrial and commercial firms. Aslib provides a service for them. There is publishing activity, but no research. But I think the publishing activities are done purely because they make a profit rather than because they want to benefit the research community.

RAYWARD: But it was such a powerful organization in its day.

MEADOWS: It was very powerful. Its information work was broken up by the financial problems it faced, which is part of the reason I think it has declined.

RAYWARD: How do you feel about the proposed merger?

MEADOWS: They'll be voting, but they won't change things for a little while yet.

RAYWARD: Are they proposing to change the name?

MEADOWS: Yes. But nobody has decided to what it will be.

RAYWARD: What are some of your ideas? I just haven't heard of what's being proposed.

MEADOWS: I've been considering names like the Library and Information Association or Information and Library Association; something along those lines.

RAYWARD: That is what has happened in Australia. The Library Association became the Australian Library and Information Association.

MEADOWS: Right. And I suspect it will end up something like that. There have been a lot of proposals, some of which are a bit complicated.

RAYWARD: How close do you think they are to completing the merger?

MEADOWS: According to reports, it could go through next year. Remember, the Library Association has a royal charter, so it must receive official approval to change. I think the structural differences between the Institute and the LA is one problem. Another problem is the huge size difference between the two organizations. The Library Association is ten times larger than the Institute.

RAYWARD: That difference is parallel to the nature of the difference between IFLA [International Federation of Library Associations] and FID [Federation for Information and Documentation].

MEADOWS: I always thought FID was set up to make the Russians happy. I mean that there were political differences as well as subject differences.

[END OF TAPE, SIDE 1]

RAYWARD: Let return to the major thrust of your work. You setup the Centre for Primary Communications. Further, you conducted a comparative study of communication between scientists and communication between historians. Let's discuss your work in more detail, Jack, because I think you were one of the earliest people, with a formal background in both science and the history of science, to study these relationships. Both those aspects of your personal history made you, I believe, a rarity in this country.

MEADOWS: Yes. It gave a particular bias, I imagine. I actually summarized a lot of that work in a book I published a year or two ago (3). But one can illustrate the particular ideas one gets from having a scientific background. I've always felt that one must take both a latitudinal and longitudinal view of things to get a complete picture. It seems obvious enough to me, but people don't do it, necessarily. To completely understand scientific communication, you must first ask why things occurred the way they did in the past before you can see why things are operating as they are in the present.

For example, to learn why a contemporary journal is organized a certain way, you must look at its past. If you look at a three-century old issue of a modern journal and compare it with its modern counterpart, you will notice that its original appearance is a sharp contrast to its modern one. That is because the journal fit the conditions of the time; but as time passed, so did its appearance. So, it seems that journals' structures have changed to fit the needs of the time they were printed. And this knowledge has practical spin-offs.

For some years, I was involved in judging for a prize that was given to the journal with the most appropriate and elegant design. I remember once when the Royal Society had submitted their journals, and the other judges and I thought they were terrible. The Royal Society journal appearance was laid down as the standard appearance in 1945; the one that everybody should take as an example. However, they were still using that same style in 1990, when it was no longer excellent. Fashion changes and style considerations were only part of the journals faults, for there were practical reasons as well.

For example, the abstract comes at the beginning of the article, in a smaller type-face than in the main text, traditionally. Now, I think abstracts were formatted that way because they were introduced long after the main journal articles had been introduced. Hence, when they were first inserted, they were written in a smaller font to be easily distinguishable from the main text. That style was acceptable when one had plenty of time to read the main article. Of course, nowadays, people scan the abstract if they do anything. So clearly, it is ridiculous to have it in small print because it's difficult to scan. In fact, the abstracts of most modern journals are written in a larger font than the main text, often in bold type, all of which makes sense.

RAYWARD: And the Royal Society still held to the former.

MEADOWS: Yes. It was very salutary. I remember, after we rejected their journals, one of the permanent personnel of the Royal Society came and thanked me. He said, "We've been trying to persuade the Fellows to change the appearance of our journals for the last three years." If you look at them now, you'll find that they are very different from what they were previously. So, I think the answer to your question is that one brings one's own background to information science, and with a background in history, one tends to look for longitudinal change.

RAYWARD: Let's discuss your interest in the computer revolution that has changed communication and information greatly.

MEADOWS: I've spent quite a number of years, particularly the last ten years, working on the computer's impact. Loughborough actually devised the first ever electronic journal in the 1980s, before I came here. I was involved in it because I was on the advisory committee, and it was one of the reasons I agreed to come here. I thought the human reactions would be interesting. The technology had been extremely difficult for most users in so many ways. Interestingly, there is virtually no problem with the technology now. The problem is with the human dimension. So over the last twenty years or so, there was a developmental period where all one's time was spent learning about the technological aspects of online communication. Now, virtually all that time is spent learning about human beings.

I always think in terms of technology as a whole, so let's compare the development of online communication with the advent of early trains. The first train excursion ever was organized by Thomas Cook in Leicestershire. This is where the first tourist started back in the 1830s. If you look at descriptions of the time, the people were drawn by a steam train, in open carriages, with ash blowing in their faces, and so forth. So, in the early days, they had numerous problems with train technology. Then, train designers solved those technological problems by devising nice, enclosed carriages with ventilation and all the rest. So they were left with the human problem—what to do with the consumer. So it's a transition you get with all these technological things, and it's been interesting to see it occur.

RAYWARD: So more and more books are being published, more journals are appearing online; where do you think it's all headed?

MEADOWS: The growth curve is not going up in exactly the same way. You're quite right.

So what happens to the players? I go back to my old picture of the author, publisher, library, and reader. How will each of them be affected by this new technology? I read a lively exchange in a recent journal article about the problems faced by the publishers of electronic

materials. The article's author described a variety of reasons why those publishers may not survive, not least of which is the ease of copying in electronic form and the difficulty of enforcing copyrights. So what is happening to the publisher's role in the middle of the chain? Moreover, what is the best way for libraries to handle the increase in materials?

One of the fascinating things is that the access to information of people in developing countries is vastly improved with internet access. In one leap, those people are on par with those people in developed countries. I have just finished a project in Brazil on the social science and humanities side. The researchers there, in fact, are reacting and working virtually in exactly the same way as people here in this country. They are guided by subject requirements, not restrained by their geographical locations. You couldn't say that about the information side previously. In fact, Brazilian universities are working to help others make that transition. If they can't give them money directly, they give people interest-free loans, and so forth, to buy computers and use the networks. As a result, those people now feel like they are a part of the global research front. They say their productivity has gone up, as do people in this country.

But the interesting thing is that quite a few people now are also saying that their creativity has increased. Now that they can access all the information sources they want, they can put it all together. Previously, a person in an undeveloped country stopped following a line of thought if he or she had a query in their mind that they couldn't answer because there was no way to obtain further information. Now, if one has that line of thought, he or she can then gather relevant information that will allow them to continue.

RAYWARD: Since, as you've said, productivity has gone up, do you think publishers feel reassured that there will need to be some conduit between the author and the reader that will allow for some concentration of material?

MEADOWS: Yes, but think of the way it works with the e-print service. I mean, they're handling thousands of requests—it must be twenty thousand a year or something—from all over the world. And there's no reason why that kind of thing can't be done for every subject.

RAYWARD: How is it supported financially?

MEADOWS: It's actually supported by Los Alamos [National Laboratory] and CERN [Centre Européen de Recherche Nucléaire] and so is transnational. But it's been suggested that contributions to this kind of thing from each university would be worthwhile. One idea is for the creation of a central index and abstracts, where you put your paper on your own web site at the university, and then people would find your paper through the index. It's basically an organizational question. What publishers are effectively doing now is acting as organizers and as guarantors of quality. As I say, both of these activities are being affected by change.

Publishers are very useful people and I am sure that they will find a way of getting around their problems.

RAYWARD: It seems that some of the big publishers, like Elsevier [Reed Elsevier Group plc] , are buying all sorts of secondary services and trying to link them to the primary journal document. As a result, users have numerous different avenues to access the full text of the same document. Moreover, there are various financial arrangements by which one may have access to these documents. So it's also quite exclusionary in the sense that it's by no means free. In fact, increasingly, it's being controlled in various ways by commercial interests.

MEADOWS: Yes. We're talking about the extent to which one is prepared to pay for information. BioMedNet offers one approach. In a sense, it reflects what communications are like when newspapers, radio, television, satellites, and so forth, are all placed under one umbrella, instead of being separated into individual companies. Elsevier's development is similarly motivated, in that they want to bring together all types of communication. That means not just the formal types, such as abstracts and journal papers, but discussion groups, e-mail exchanges, and all the rest. BioMedNet brings the whole lot of them together and, for a fee, you can do any of these activities within the community. As of now, they claim the BioMedNet is about one hundred and fifty thousand strong, so you're getting a pretty good critical mass. Now, they are saying, "Look you need us to organize that kind of activity for you." So they hope to succeed by attracting customers with a comprehensive service that no one else can offer.

RAYWARD: Having looked at BioMedNet, it seemed to me that the services they offered were fairly thin. For instance, they were able to provide a set of Czech journals, which isn't very exciting for a majority of the public.

MEADOWS: Right! [laughter] Except to the Czechs! I think you are right. They're still striving hard and they have a long way to go.

RAYWARD: Yes. And there's no reason why they can't bring all sorts of other service into their sites through licensing agreements and so forth.

MEADOWS: And of course, there is a public forum, and a lot of services are free. My feeling has for a long time been that if the learned societies grasp this particular approach, they're in a better position than any commercial venture. Because, after all, they do run special groups and have done for years. They have their own conferences, their own symposia, and all the rest of it. So they are integrated already in terms of the information they are handling. It's a question of organizing all of the material.

Now, the American Physical Society is on the ball when it comes to organization. They're trying to do something like BioMedNet. They have a variety of contacts with their membership. People have subscribed to many of their journals, so they've got a subscription base that Elsevier would give its back teeth for. It's essentially that learned societies, at least some of them, has been a bit slow on the ball. But I think the message is beginning to get through.

[BRIEF INTERRUPTION]

RAYWARD: Were you in personal contact with [Donald J.] Urquhart?

MEADOWS: He was a generation ahead, but I did have contact with him and, oddly enough, he was the advisor when I was appointed here. So, yes, I knew him.

RAYWARD: He was a great innovator.

MEADOWS: Yes, he was. He came into the library world just as Bradford was retiring. He never thought much of [Samuel Clement] Bradford. Maybe he was right, but it was Bradford who got things started, I discovered. Bradford was the first to assert there would be a central science library someday, come what may. He also affixed a large, brass plaque to the door of the Science Museum Library, which unofficially declared this to be the National Science Library. [laughter] So he had the vision before Urquhart, actually.

I remember when Urquhart gave me a tour of Boston Spa not long after it opened. The building had been a factory before it was the Boston Spa, and was ex-War Department surplus. It was still set up the way it had been for the factory, and they still had the conveyor belt which had been used in the factory. It was now being used for the books. It was a fascinating thing.

RAYWARD: The Boston Spa is one of the great success stories of the British Library, I think. It's also a decent revenue producer these days.

MEADOWS: Yes. Even though the Boston Spa has cut back a bit since the days when it ignored copyrights. That was a long-running saga.

RAYWARD: The Boston Spa actually ignored copyrights?

MEADOWS: Effectively. Under British law, one could make individual copies for research purposes.

RAYWARD: It must've been a fair use provision.

MEADOWS: That's right. The Boston Spa photocopied journals for individual researchers as they wanted them, which seems fine. But in some instances, the Boston Spa might photocopy a particular journal two or three hundred times and send them out to as many people. Was this fair use or not? That kind of argument was typical in countries with a different fair use provision, like France, for example. When somebody in France wanted a journal article, they went to Boston Spa, and the Spa sent it to them in France. After a while, the French became terribly annoyed with that process, of course. [laughter] This sort of thing lasted 15 or 20 years.

RAYWARD: What brought it to an end? Was it a court case?

MEADOWS: No. Its end was brought about by the cumulative pressure of publishers and governments over a long period. It was when there was a change in directors. Further, by that time there were other document-deliverers in the field who were paying copyright fees, and they questioned why they had to pay fees for exactly the same service as provided by the Boston Spa. Furthermore, the international copyright centers had been set up by that time. So there was a copyright licensing agency set up in this country. It was going to start charging the university students for multiple copying, and so you now had a body in this country that could actually receive copyright fees. So all of that changed the situation.

[BRIEF INTERRUPTION]

MEADOWS: Derek Price's writings were influential in terms of turning my interest to this field, and so were [Robert King] Merton's.

RAYWARD: What was the title of that book Merton wrote?

MEADOWS: *The Sociology of Science* (4). One of the things Merton did, which I found fascinating, was apply sociology to historical situations and point out the contemporary implications of it. For example, he published a fascinating paper on controversies about priority in publication, following them from the early days of journal publishing to the present. He pointed out that the number of priority disputes had actually decreased even though the number of people publishing had increased. He deduced from this some interesting thoughts about what

had happened to produce this result. One of the things that interested me particularly was that the journal situation had been tightened up so that there was less likelihood that there would be uncertainty about priority.

RAYWARD: Did you have personal contact with him?

MEADOWS: We communicated by mail, mostly.

[BRIEF INTERRUPTION]

RAYWARD: You also knew Arnold Thackray, correct?

MEADOWS: Yes, I knew them all because I was head of the history of science department at Leicester, which means I met a lot of historians. One of my colleagues was an historian of chemistry. I believe Arnold Thackray was an external examiner. It was an amusing experience to meet them all.

The colleague I was mentioning was a professor who has just retired recently. He got interested in this idea of journals, and he and I did a fair amount of research together on the role of journals in Victorian science. That work, in fact, has become quite popular. Earlier this year, I went to a three-day international conference in Leeds that was devoted entirely to periodicals in the Victorian period. So, what we started back in the 1960s is becoming a mainline research topic after thirty or forty years, which is pleasant.

RAYWARD: Did you ever associate with Gene [Eugene] Garfield?

MEADOWS: Yes, since back in the early days. And I've been over in the [United] States. I obviously visited him and so forth. They gave me a very nice sort of farewell down at Cranfield [University] recently. Cranfield, I think you know, was one of the really important centers in the early days of information science. Cranfield conferences were famous. Garfield was not well, but he actually came over for it, which I thought was extremely kind of him. In turn, I have just contributed a chapter to a festschrift for him (5). Were you involved in that? Blaise Cronin, another one of the Aslib people, was editing it. So it was nice to be able to offer something to Garfield, because he's given so much to other people.

RAYWARD: Yes, and is still doing so. Take, for example, my [Garfield] fellowship. Were the Cranfield studies before your time?

MEADOWS: They were before my time, but I knew some of the people, and got several of them to tell me about it. This line of information retrieval was very small scale in a way, but it was one that got support on a continuing basis from British Library department, and which we all thought was going to be important one day. Eventually it was, but it took a hell of a long time; longer than we expected, actually.

RAYWARD: Are you referring to the early studies of Cleverdon?

MEADOWS: That's right. Then they were developed by Karen Spark Jones, at Cambridge [University]. There was an interesting line of development there. Jones took it up with students, including Steve Robertson, who is now at City University. And Jones pulled in Roger Needham.

[END OF TAPE, SIDE 2]

MEADOWS: So Roger Needham was involved in doing it, and one of the first people he hired was Steve Robertson for a new centre at Cambridge recently. So, you know, the whole thing almost came full cycle. But it wasn't until the 1990s that all that early stuff was taken on board.

RAYWARD: The various experiment studies went on for a long time, didn't they? They included the work done by [Gerard] Salton, in the United Sates.

MEADOWS: There's this TREK thing where they all get together to see who can do best in retrieval. It's almost a throwback in principle to the Cranfield approach, where you had a given set of data, and you tried to see who could do better. But the interesting thing is that the fundamental breakthroughs were made early on. There haven't been breakthroughs in principle in recent years, and the application of known principles has gone very commercial, of course. So, there is that line of descent, so to speak, that I saw grow up. Can't say I ever wanted to be in the information retrieval game myself, but it's interesting to observe.

RAYWARD: Yeah, because it became one of the components of the emerging field of information science.

MEADOWS: Yes. There was a festschrift for Bertie Brooks. Brooks was another information science pioneer. Bertie had some wonderful stories about UCL. One of those stories involved

[John Burdon Sanderson] Haldane, a genetics statistician, and his obnoxious wife, Helen Spurway. I came across her, myself. I think she was a nurse, actually. While at Oxford University, I heard Haldane give a lecture. As he began, a woman in the front row yelled out, "No, you've got that one wrong!" It was Haldane's wife! That happened during the War [World War II].

According to Brooks, Haldane's wife was strident anti-War protestor. At one point, she was incarcerated in Holloway Jail for her protests, and the provost asked for someone at UCL to voluntarily bail her out of jail. And everybody refused to do it! [laughter] In the end, the provost told Brooks, "Either you will bail her out, or your head's on the line." So Brooks had to bail her out. He was the most unpopular man in UCL!

Brooks was great fun. He was a very, very strict statistician. I remember an argument with him on that matter. And I'm sure he was right, but, you know!

RAYWARD: He was very important in terms of bibliometric studies.

MEADOWS: Yes. I actually started on bibliometric studies. As I've said, I wrote my first information paper way back in the 1960s. It was about bibliometric studies. That was why I was pulled in when scientometrics got started. It's now a much more complicated subject, of course.

RAYWARD: Yes. I think it's become very highly mathematical.

MEADOWS: Yes. It has developed quite an interesting split between theory and application. A lot of us became interested in scientometrics back then because it seemed to offer ways of making statements that had been impossible in the past.

RAYWARD: Was this partly stimulated, too, by the advent of the science citation indexes? I mean, how were the data gathered?

MEADOWS: Manually, as far as I was concerned. But once they were available electronically, it became easier.

RAYWARD: They came along in the 1960s, I think.

MEADOWS: Yes. It actually took a little while to create a backlog of citation data. The data storage sometimes worked very poorly. You still had to look through the print-out and go through things manually. Anyway, Brooks went on to become a visiting professor at City University and continued on to a ripe old age; he's still going in fact.

I diverted from your question about information science and retrieval. The reason I diverted was that for Brooks' festschrift I wrote a paper on the role of theory in information science (6). It wasn't a very good title, but the real question was: how can you picture information science? You know, is information science a single discipline or not? My argument was that there was a basis for a discipline in theory.

We have to think of it like a landscape in which there are a series of mountains and a fair number of hollows in between. The highest mountain of the lot was information retrieval. Since then, some of the other mountains have come up. For example, another mountain is bibliometrics. But is there something that can fill the hollow between bibliometrics and information retrieval, or are they really separate mountains? And I felt that there was something that could fill in there, and elsewhere, to create a discipline.

RAYWARD: And I think that's happened subsequently.

MEADOWS: It's happening now. So, as the landscape begins to fill out, you can discern that there actually is a discipline that can be unified.

RAYWARD: The social studies of communication in science could be one of those mountains. There has been a lot of interest in that for a while, and continues to be.

MEADOWS: That's right. If you sit back and think of it, you can see various peaks in information science. Think of ones that might be included—information management is another area, or knowledge management. I'm just finishing a book at the moment, in which I'm trying after many years—and I'm still failing—to distinguish between data, information, and knowledge. There is a perennial question: if you don't know what those terms mean, how do you ever map out the whole science? So it is a problem. But, nonetheless, there is a discipline there, basically.

RAYWARD: I think one sign of it is all the people who are doing work that they see as related to something and that you can identify or define perhaps in sociological terms. The definitional problem often seems to me to be rather barren.

MEADOWS: It is. I mean, there's a paper that appeared in *Information Processing and Management* a while ago, in which the author went through meanings of the word "information" which, he said, covered 367 different definitions (7). That estimate might have been a little excessive, but it doesn't alter the fact that he must question whether we are talking about the same thing when we talk about information in one science versus information in another.

RAYWARD: Yes, quite. And I think most of us, up to some point, would say these are different sorts of information.

MEADOWS: Yes, but up to what point? That is an interesting question.

RAYWARD: I touched on it in something I wrote some time ago. And then I just said, "Well, let's move on," because no final answer is possible.

MEADOWS: True.

RAYWARD: So you establish a limit for your own purposes and then do whatever it is.

MEADOWS: Absolutely so. The reason I was writing this book is because you have to give students a coherent picture information science when conducting an introductory course in the subject. Now, there may be any number of coherent pictures, so I simply have to determine which definition is the easiest for students new to information science to understand.

RAYWARD: I also think that if you look at some of these discussions, they're in disagreement at the edges. So it becomes a question of where you draw a line around something. And it seems not to matter whether somebody draws it here or there, because it's still pretty much the whole thing.

MEADOWS: I agree, in general. But one must be somewhat cautious about the picture one adopts because it can drive events. Consider the "D" in FID—"documentation." That word "documentation" has separated out categories of people, so to speak, because it means one thing in Eastern Europe—or it has in the past—and another thing in Western Europe. So you can be talking at odds with each other.

RAYWARD: I think informatics is another one of those terms.

MEADOWS: Yes. In fact the informatics department here, as you may have gathered, is supposed to move next year. It will be combined in one building with departmentcomputer sciences and human sciences. There's a question about what one might call an umbrella organization, and "informatics" is one of the names that have come up. The vice-chancellor liked "informatics," but none of the people in the departments liked it, because they thought it gave the wrong signal.

RAYWARD: What did you decide?

MEADOWS: We don't actually have to give it a name yet because the departments will remain separate entities. However, it would be nice to have some umbrella term for the building. Like that horrible new building down there that calls itself Business Studies. It's painted badly inside and outside, but at least it has a single name. But, you know, nomenclature has this problem, because, as I think you were saying, you can't reflect the divisions.

RAYWARD: Yes, I know. The major division so far has been the library—the use of the term "library" and what it connotes.

MEADOWS: The library in a sense has been easy, because you know what a library is, or you think you do. You don't what information is because you can't point to an institution in the same way as you can with a library. The further problem is that in computer science there is. It's similar to libraries in the sense that you can say, "look there is a computer." And computer science overlaps with information science increasingly and is introducing its own terminology. Nomenclature, again, can divide rather than unify.

[END OF TAPE, SIDE 3]

[END OF INTERVIEW]

NOTES

1. Derek J. Price, *Little Science, Big Science* (New York: Columbia University Press, 1963).

2. A. J. Meadows. "Early Reactions to Information Growth," *Scientometrics*. 51 no. 3 (2001): 553-561.

3. A. J. Meadows, *Communicating Research*, (San Diego: Academic Press, 1998).

4. Robert K. Merton. *The Sociology of Science: Theoretical and Empirical Investigations*, ed. by Norman Storer (Chicago: University of Chicago Press, 1973).

5. A. J. Meadows, "The Growth of Journal Literature: A Historical Perspective." *The Web of Knowledge: A Festschrift in Honor of Eugene Garfield*, ed. by Blaise Cronin and Helen Barsky Atkins. (New Jersey: Information Today, Inc., 2000): 87-109.

6. A. J. Meadows, "Theory in Information Science," *Journal of Information Science*, 16 no. 1 (1990): 59-63.

7. E. Hoffmann, "Defining Information," *Information Processing and Management* 16 (1980): 291-304.

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