Current Comments

Information Science Education-
An Ivory Tower of Babel?

In October of this year, the American Society for Information Science (ASIS) will present its first annual Outstanding Information Science Teacher Award. ISI@ will sponsor the award, which carries a $500 honorarium, and also give financial support for its administration. To be an eligible candidate, one must be directly involved with teaching some aspect of information science on a continuing basis. Those interested in nominating anyone should consult the April 1980 issue of the *Bulletin of the American Society for Information Science1* or see the announcement in this issue of *Current Contents@*. Nominations for this year's award must be submitted to ASIS by June 30.

Information science education has come a long way since I went to school. It was just 25 years ago that James W. Perry and Allen Kent began a course entitled "Machine Literature Searching" at Western Reserve University.[2] Up to that time, there was not a single information science curriculum anywhere in the US. But during the 1960s and early 1970s, academia embraced the new discipline. By 1973, ASIS was able to report the existence of 91 graduate-level information science programs in North America.[3]

In light of the new ASIS award, it is worth examining the current state of information science education. The subject is of obvious interest to me. I've given a graduate lecture course on information retrieval for many years at the University of Pennsylvania in the department of computer and information science (CIS) headed by Aravind Joshi. At Penn, the CIS program is given in the Moore School of Engineering.

I believe this discussion will interest even those who are not specialists in, or students of, the field. Since it touches on so many disciplines, one or more aspects of information science are often integrated within other, more traditional curricula. For example, the Georgia Institute of Technology's School of Information and Computer Science offers courses entitled "Medical Information Systems" and "Biomedical Literature and Libraries."[4] These are designed for those planning a career in the biomedical sciences.

It is gratifying that information science has gained such widespread academic acceptance in so short a time. Unfortunately, as Tefko Saracevic of Case Western Reserve University points out, the development of academic programs for information science has been chaotic.[2] There seem to be as many approaches to the subject as there are schools that teach it. Students can enroll in many different schools to earn an MS degree in information science. But after a year or two of study, many of them will have taken few courses in common.

The confusing state of affairs in information science education is widely acknowledged and bemoaned? The situation is aggravated by the lingering

uncertainty over just what is meant by the term "information science." I myself have difficulty in explaining my profession to others.8 And among the prodigious amount of literature that has been written on information science education, it is a rare paper that does not devote at least a few paragraphs to redefining the field. Furthermore, the problem is complicated by the existence of the separate field of information theory, which also interests many people in information science.

A few years ago, a former executive director of ASIS defined information science for a US congressional subcommittee.9 What he told them is fairly typical of the many definitions one finds in the literature. He said, "Information science is the study of how information is transferred from the point of generation to the point of use-and all the intermediate steps of collecting, organizing, interpreting, storing, retrieving, disseminating and transforming information. As a discipline, information science stresses the application of modem technologies to the handling of information."9

Many of the functions described above fall within the domain of traditional librarianship. Is it possible to distinguish between the two disciplines? One idea that enjoys some popularity is that ***information science*** is a basic and research oriented discipline, while *library science* is its applied component.10 But this view is not universally accepted. Michael K. Buckland, University of California, Berkeley, notes that for most of the people who identify themselves as "information scientists," the discipline is very much applied. 11 Vladimir Slamecka, who heads the Georgia Institute of Technology's School of Information and Computer Science, adds that the development of theoretical underpinnings for information science is still a distant goal.12

Many years ago, I solved this problem by calling myself an information engineer. However, I never heard anyone described as a library engineer.

The same interdisciplinary quality that makes information science hard to define is also partly responsible for the current chaos in its teaching. During the 1960s practitioners in a number of fields claimed the new discipline for their own. Information science programs were started in a variety of schools and departments. With few exceptions, they became permanently entrenched there. Consequently, the content of any information science curriculum is greatly influenced by the academic environment in which it is taught. 13

In many universities it was the graduate library school that began to offer information science programs. Indeed, graduate library schools now house more information science programs than any other academic entity.5 During the past decade, a number of them changed their names to "Graduate School of Library and Information Science," or some such variant.13,14 But Buckland observes that in some cases the name change was purely cosmetic. Some schools interpreted information science to mean library automation.15 This narrow view ignores the intellectual implications of new retrieval technology.

In some universities, the information science program began in more technically oriented environments, such as schools or departments of engineering or computer science. In fact, as Gerald Jahoda, Florida State University, notes in a review article, the first graduate program in the US began in 1963 at a technically oriented institution-the Georgia Institute of Technology.16

But even within an engineering department, one sometimes finds the words "information science" loosely ap-

plied. Saracevic asserts that the term is often a euphemism for computer science.13 He notes that this usage is also common in Europe, where the term "informatics" is widely taken to mean data processing. 2 However, in the USSR and other Eastern European countries, the term "informatics" is similar in meaning to North American "information science ."

In very few cases, even business schools began to offer full-blown information science programs. It is possible, for example, to earn a Master of Business Administration degree in information science from Temple University, Philadelphia. 17 At the University of Pennsylvania, a cooperative program between the Moore School's CIS department and the Wharton business school allows a student to earn both an MS and an MBA degree.

A few institutions have totally separate information science departments. In 1967, the University of Dayton established its department in information science within the College of Arts and Sciences. 18 More recently, the University of Pittsburgh has also started a separate department. 19 The information science program at Pittsburgh began in what used to be a traditional library school. It eventually developed into a separate department within what is now called the Graduate School of Library and Information Sciences. But it is too early to tell whether or not the separate department idea will catch on.

Not everyone agrees that information science should be taught as a separate discipline. Last year, Jean Tague, University of Western Ontario, asked representatives of all seven Canadian graduate library schools if they were considering a separate degree program in information science. Their answer was a unanimous and emphatic "no." All of them stressed the importance of integrating information science and library science within a single curriculum .20 Tague notes that some of these representatives were concerned with information science only insofar as it applied to library automation.21 But their resistance to the separate curricula idea has supporters in the US also, as we shall see. 11-22

Among the few generalizations one can make about information science curricula is that most programs are offered at the master's level. Some library schools do offer PhDs in "library and information science." A recent survey published by the industry newspaper In-*formation* World showed that of the 19 graduate library schools in the US that have the word information in their names, nine offer PhD programs.23 One should remember, however, that not all library schools that offer information science curricula have changed their names. An example is the Case Western Reserve University's School of Library Science. Some technical schools and departments that have information science programs also offer PhDs on the subject. Included among them are the Georgia Institute of Technology and the department of computer and information science at Ohio State University.

It seems impossible to describe a typical master's program in information science. A 1971 survey by Jack Belzer and colleagues at the University of Pittsburgh24 is as close as one comes to doing so. The survey, which was updated in 1975,2 reviewed 45 information science programs in North America without regard to the academic environments in which they were housed. It identified a number of common information science courses and reported percentages of the institutions surveyed that included these courses within their curricula. The data provided by the survey and its update proved extremely valuable for assessing the state of information science education in the early

1970s. But it is nevertheless difficult, if not impossible, to construct a "composite" program from the survey data.

Still, one can make some general observations by examining information science programs when they are segregated according to academic department. While it is true that two curricula offered within schools of library and information science may differ markedly, they will certainly share more characteristics with each other than they will with, say, a curriculum offered in a school of computer and information science.

Nearly all of the 64 accredited library schools in North America offer at least some information science courses. Twenty of them offer full-fledged information science programs.[2] Tague reports that all seven Canadian graduate library schools have, in varying numbers, faculty members who specialize in information science as opposed to traditional librarianship.[20]

Within library schools, a certain core of information science courses was identified in a recent survey by Howard Fosdick, University of Illinois. Fosdick defines an information science course as one that "would not have been offered in library schools prior to the interest in and awareness of information science as a field in its own right in the 1960s."[26]

Such courses usually fall into five distinct categories: library automation, information storage and retrieval, information systems analysis, interactive on-line computer systems, and programming. Varying percentages of the 54 library schools Fosdick surveyed offered courses in each of these categories. More than 80 percent of the schools offered courses in both library automation and information storage and retrieval. Systems analysis and interactive on-line systems were offered in 48 percent and 28 percent of the schools respectively. Only six percent of the schools offered courses in computer programming.[26]

It should be mentioned here that Fosdick's figure for the percentage of library schools teaching on-line systems does not give a true picture. Several schools, such as those at Drexel University[7] (formerly Drexel Institute of Technology), Philadelphia, and the University of California, Berkeley,[11] do not offer formal courses in on-line training. Instead, this training is included within basic required courses. Moreover, a number of schools offer on-line searching as an elective course. Indeed, a 1977 survey by Stephen P. Harter, University of South Florida, found that nearly every library school in the US provides students with on-line access to bibliographic data bases.[28]

At the Drexel University School of Library and Information Science, students can earn a Master of Science degree in one of three areas of specialization: general librarianship, information science, and educational media.[27] Figure 1 lists the courses from which an information science major at Drexel normally selects a program. The two courses entitled "Fundamentals of Library and Information Science" are required of all students in the school, regardless of their major. The Drexel graduate bulletin acknowledges the interdisciplinary nature of information science, and advises students that courses in other schools within the university may complement some of those listed in Figure 1.[27]

Given the current state of information science education, one hesitates in calling Drexel's program representative of those that developed within traditional library schools. But it is typical in that it does not entirely divorce information science from a library setting. Drexel is among the minority of library schools that include a computer programming course as part of the curriculum. But its master's program does not require many technical courses, and this is the case for most information science programs

Figure 1: The master's program in information science at Drexel's School of Library and Information Science. Students may complement this program with relevant courses from other schools within the university.

Fundamentals of Library and Information Science (2 -(courses)

Search Strategy

Abstracting and Indexing

Technology of Information Storage and Dissemination

Library Automation

Library and Information Networks

Computer Programming for Information Processing

Text Processing by Computer

Kesourcec In S<lence and Technology

Information Center Management

Information Systems Analysis

Mea\uring Library UW

Method\ of Research In Library and Information S(lence

valudtlon of Information Systems

housed in library schools. In the Infor-*mation World* survey, 50 library schools identified themselves as at least "emphasizing" information science in their curricula. Of these, only 23 required *any* technical courses to complete a master's program.23

Predictably, information science programs housed within technical schools differ markedly from those in library schools. Those differences start with admissions requirements. Most graduate library schools require little, if any, specific undergraduate course work. Saracevic observes that while many schools recommend that students have a background in computer languages, mathematics, and statistics, these recommendations are almost never enforced.13

But candidates for degrees in information science from technical schools are often required to take undergraduate course work in calculus, linear algebra, computer programming, and statistics. At the Georgia Institute of Technology, it is possible for students to be admitted to the information science program without some of the required courses. But such students must take remedial course work in these areas. These courses do not count toward the graduate degree .4

Figure 2 shows the courses available in the master's program at the Georgia Institute of Technology's School of Information and Computer Science. The

@w 2: The master's program at the Georgia Institute of Technology's School of Information and Computer Science. No credit toward the MS degree is given for courses marked with an asterisk.

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Computer  Systems

  * Computer  Logic  Design
  * Computer  and  Programming  Systems
    Computer  Networks
    Computer  Systems  Evaluation
    Advanced  Small  Scale  Computer  Systems
    Advanced  Computer  Organization


Computer  Software

  * Info.  Structures  and  Processes
  *I Survey  of  Programming  Languages
    Computer  Language  Design
    Computer  Operating  Systems
    Design  of  Computer  Operating  Systems
    Data  Base  Design


Information  Systems

  * Information  Systems
    Information  Systems  Design I, IT
    Medical  Information  Systems
    Information  Control  Methods
    Health  Care  Processes  & Systems
    Biomedical  Literature  &  Libraries


Information  Processing  Applications

    Computer-Oriented Numerical Yethods
    MIS  Methodology
    Information  Storage  and  Retrieval
    Computer  Graphics
    Computer-Aided  Yodeling
    Artificial  Intelligence
    Pattern  Recognition
    Graph  Theory
    Medical  Instrumentation  &  Techniques
    Biomedical  Electronics


Management

    Operations  Research
    Management  Accounting & Control
    Organizational  Problems
    Organizational  Decision  Making
    Organiz. & Mgt. of Info. Industry


% No Credit  toward  the  Y.S. degree
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curriculum stresses the theory and design of information systems, rather than their operation. The courses are more technically oriented; that is, they stress a higher degree of quantification, than one would expect to find in a school of library and information science. Significantly, the catalog descriptions of the courses entitled "Information Systems," and "Information Systems Design I, II" do not even mention the word library.[4]

Glynn Harmon, University of Texas, Austin, suggests that the housing of information science programs within several academic departments is an indication of the field's newness.[29] If this is true, then perhaps the appearance of academically independent programs can be taken as a sign of maturity. In no other North American institution is the information science curriculum more cleanly separated from other academic programs than at the University of Pittsburgh.[19]

At the University of Pittsburgh, the Graduate School of Library and Information Sciences houses the department of library science and the interdisciplinary department of information science. Both departments have their own distinct curricula, faculty, admissions requirements, committee structure, budget, and facilities. James G. Williams, an associate professor in the information science department, explains the reason for this approach: "We recognize that libraries are a special kind of information system. But we found that courses in library automation simply did not interest our more scientifically and commercially oriented students. To take a shot down the middle satisfies no one. Thus, separate curricula for library science and for information science."[30]

Candidates for an MS degree in information science from Pittsburgh must have had one term of undergraduate course work in each of the following areas: behavioral science, "college-level" mathematics, statistics, and computer language.[31] Students admitted to the program may enter one of two "tracks" of specialization. The information systems specialist track concentrates on the design and evaluation of information systems. The information counselor track offers training in "the assessment of human information needs and in prescribing procedures that enhance the effective transfer of data and information . "[31]

Figure 3 lists the courses a student might take to complete the information

Figure 3: The master's program in information science (information systems specialist track) at the University of Pittsburgh. A new *Bulletin,* now in press, contains some minor revisions to this list.

Minimum six credits of basic courses
Minimum 18 credits in the major area
Minimum six credits in a minor area
Minimum six credits of practicum

A sample program that meets these requirements would be

Basic
1. Introduction to Information Science (three credits)
2. Philosophy of Information Science (three credits)

Major
3. Information Technology (three credits)
4. Information Systems (three credits)
5. Information Networks (three credits)
6. Interactive Systems (three credits)
7. Information, Communication, and Coding Theory (three credits)
8. Assembly Language Programming (three credits)

Minor
9. Foundations of Behavioral Theory (three credits)
10. Human Factors in Systems (three credits)

Practicum
11. Practicum (six credits)

systems specialist track. The list is taken from the Graduate School of Library and Information Sciences' 1978[30] *Bulletin*. The emphasis of the program seems to fall somewhere between a library oriented curriculum and a technically oriented one. Reading down the list of courses, one sees that information systems are viewed apart from a library setting. Yet the courses are not as quantitative as those offered by technical schools.

For example, the catalog description of the course entitled "Information Systems" reads: "Studies techniques for analysis, design, and evaluation of information systems.. .. Emphasis on analysis of behavioral aspects of user community."31 A course with the same title at the Georgia Institute of Technology does not even count toward a graduate degree. (See Figure 2.) Instead, students must enroll in "Information Systems Design I, II" to satisfy graduate requirements. These courses teach "analysis and synthesis of information systems, emphasizing mathematical modeling."4

The University of Pittsburgh's total separation of library science from information science does not meet with universal approval. The University of California, Berkeley, for example, has deliberately avoided this approach. Buckland, dean of the university's School of Library and Information Studies, is among those who think that the term information science has been too loosely used by academics! "We don't make a rigid distinction between the two fields," he says. "If there are two things with different labels, you're liable to end up looking at how different they are instead of how similar they are."11

Buckland views library science and information science as parts of a single, broad field. His point is illustrated by a statement he made three years ago to a Conference on Education for Information Science at the State University of New York, Albany: "Many of our students take a course in policy analysis, the art of how to make.. . [difficult] decisions in the context of libraries and information services. It is pointless to try and distinguish whether that is librarianship or information science."6

The dichotomy that exists in North America between library school and technical school curricula in information science has its parallel in Europe.

Last year, I.S. Simpson, of Newcastle-upon-Tyne Polytechnic, published an historical overview of the development of information science curricula in Great Britain.32 In British schools, the teaching of information science is closely associated with a library setting. On the other hand, the graduate curriculum in informatics and systems science at the University of Stockholm contains a heavy dose of cybernetics.33 It resembles the programs offered at North American technical schools in that information science is treated apart from a library setting. This program is due to the pioneering work of Kjell Samuelson.

The confusing state of affairs in North America has not discouraged a rising interest in information science education for students from developing nations. This interest stems from an awareness that information specialists will have a role to play in the development plans of many Third World countries.34

In 1974, Case Western Reserve University began its master's level International Program in Information Science and Library Automation.35 The theme of the program is the role of information in development. It includes two seminars entitled "International Transfer of Knowledge in Information Science," and "Problems in Information Science Education in Developing Countries." During the course of the program, students are exposed to such topics as the development of particular national information services, and applications of information technology. Several members of the university faculty have teaching experience in developing nations. Many students in the program receive fellowships from their respective countries.35

Since 1974, Unesco has sponsored a master's program at Loughborough University in the United Kingdom in which students from Asia and Africa are

trained as information specialists.[36] Most of the students are faculty members of library schools in their home countries. The curriculum requires a dissertation. Dissertation titles have included "A National Information System: A Model for Uganda," and "Information Needs of Library Users in Higher Education and Research in Ghana?"

It bears repeating that information science is a young field. It seems only natural that it should experience "growing pains . But there is hope that the future will bring some agreement among the many different views of the field. For the past two years, a study has been underway to define the functional boundaries of information science, and to classify the various information specialties. The study, headed by Anthony Debons, University of Pittsburgh, is funded by the National Science Foundation. It is scheduled to be completed shortly .[37]

Debons thinks the study represents a start toward bringing order to information science education. It will identify the jobs that information professionals perform, and the backgrounds that these people possess. This should provide a better understanding of the differences that now exist in educational policy. But Debons does not expect a miracle. "The senior people in the field come from diverse backgrounds," he says. "They all continually redefine what information science is according to their own experiences and intentions. I don't believe we're going to get away from that for another two decades-not until the present graduates assume leadership positions within the field. They are the ones who will provide the synthesis necessary to approach order."[38]

Until that time, the lack of conformity among information science programs need not hamper innovative approaches to education in a rapidly changing field. In closing, I find it somewhat ironic that Johns Hopkins University, where I began my career in information science, and MIT, where Calvin Mooers named the field of information retrieval, have never developed programs in this field.

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