Access to Interdisciplinary Information:
Setting the Problem

by
Joan B. Fiscella

*University Library,
The University of Illinois at Chicago*

Abstract: Identifying and locating interdisciplinary literature, and ideas and information that reside in different disciplines, poses problems for researchers and students. Using electronic means of access, such as online indexes and abstracts and online library catalogs, has provided more flexibility and reduced the amount of time needed for the search process. But scholars continue to question the completeness of the resources for their interdisciplinary work. In part, the problems are due to structures of disciplinary literature and the various forms of access that support current academic and scholarly publications. Scholars can overcome some of the problems with flexible research approaches congruent with the available tools. More importantly, perhaps, groups of interdisciplinary researchers could initiate the development of a taxonomy and language specific to interdisciplinary study and teaching.

ACCESS TO INTERDISCIPLINARY information, that is, access to published work that crosses or integrates disciplines, is a multi-dimensional issue, stemming from both the structure of information in relation to the disciplines out of which it arises, and from scholars' stances in relation to their research. Contributing to the scholars' frameworks are the knowledge which enables them to move comfortably from discipline to discipline, their understanding of commonalities and differences among structures of literatures and access tools, and their flexibility of thinking as they chart the maps of these structures.

Teachers and scholars with advanced degrees in a discipline have been educated in the main issues of their discipline and specialty within it, including the history, methods, and the primary literature which carries the conversations of the discipline, and have been led to awareness of key scholars who have shaped the field. Those who move into, or reach across to, a new specialty or discipline are in the same position as any novice in a field, having to learn the current problems and methods, their connection with the traditions of the field, and ways to move around in the new field. Presumably these navigators can learn more quickly, because they have a fairly clear purpose in sailing the new waters, they have a sense of how scholarship works, and they know what sorts of resources should be available. Thus the issue from the researcher's point of view is effective learning: in a reasonable amount of time, how to learn enough of the new field to use it as needed, how to find out to whom to talk, and how to decide whom and what to read.

Success in finding information or literature across fields is sometimes elusive. This is true for both the researcher who is a novice in a different field and the student learning the research process. Contributing to difficulties in identifying literature across disciplines are the shapes of the disciplines involved, the means of access which have been developed, and the techniques or approaches that the researcher or student uses to enter into various fields of study.

In what follows I shall deal with both aspects of the question: the problems posed by the structure of scholarship and access to it, and some considerations for researchers who wish to work effectively with the resources in order to identify relevant literature for interdisciplinary work. My aims are to provide contexts for the problem of access to information and to suggest directions for further study. I do not claim to have solved the problem, nor to have provided a recipe for interdisciplinary research.

Access to interdisciplinary information varies according to the structure of interdisciplinary areas. From an information standpoint, interdisciplinary scholarship falls into three categories. The first category concerns itself with definitional and theoretical problems of interdisciplinarity as such and other attendant issues: for example, what is interdisciplinarity, what methods of research are effective, what problems are particularly amenable to interdisciplinary analysis; how are interdisciplinary programs developed, administered, evaluated, etc. A second category concerns the scholarship and educational activities of certain well-established interdisciplinary themes such as Utopia, environmental studies, American studies, women's studies, play. A third category is much more diffuse, encompassing any problem,

topic, theme, or issue about which someone writes or teaches, that could be described as interdisciplinary, but which is published in diffused outlets or is too idiosyncratic at the time to have its own developed conversation, or literature. Illustrations are as various as the use of literature to provide an added dimension to issues in medicine or an essay which draws on intellectual history to give perspective to a current problem. For example, Michael Heim's (1987) *Electric language: A philosophical study of word processing* integrates philosophy, the history of technology, and aspects of computer science. Although this third category has no single focus, the literature grouped in it can be invaluable for providing models and cases of interdisciplinary work.

The first category focuses on the nature of interdisciplinary enterprises and the second is more problem- or issue-centered. The third could include literature on problems which are newly recognized to be more productively studied through interdisciplinary approaches, or writing which unself-consciously exhibits cross-disciplinary learning. Although each of these three categories presents somewhat different problems of information access for the researcher, common issues lie at the base of them.

The obstacles that many researchers and educators have experienced in trying to identify and locate literature in fields other than their own have their roots in a complex of problems. Different subject matters imply networks of issues, disciplinary structures, and academic values. The literature or tools which help provide access to these subject literatures also have their own organizations which function as maps to the disciplinary or interdisciplinary literatures. In what follows I shall look first at factors contributing to the literature of scholarship and then turn to means of access.

Disciplines and Their Literature

Over twenty-five years ago, Joseph Schwab described the structure of disciplines as composed of two major elements, conceptual and syntactical. "… [C]onceptions which define the investigated subject matter of that discipline and control its inquiries" (p. 199) are guidelines for developing the discipline by defining appropriate questions and determining the range of insights which can validly throw light on those issues. For example, a scientist will develop a new approach to research working not only from new facts, but from a particular interpretation. The syntax of a discipline is that set of procedures, methods and conceptions used to attain its goal, and both goal and syntax vary from discipline to discipline (pp. 203-204). In brief, each discipline can be defined by the specific subject matter it

studies, its perspective on the subject, and the way in which it approaches its developing knowledge. For instance, Schwab points out that the sciences and mathematics differ in their subject matters (material things vs. number) and the way in which they develop knowledge (the methods of testing their discoveries).

Since the time of Schwab's article, the structure of disciplines and communication within them have been studied more extensively, notably by Ziman, Garvey & Griffith, Price, Polanyi, Crane, and Kuhn, as well as others (all cited in Pierce, 1987). Sydney Pierce, in his treatment of differences between professional and "pure" knowledge fields, points out that some of these studies have concentrated on small groups of scientific researchers working on very specific problems (pp. 148-149), thereby highlighting the importance of informal groups. However, he argues the importance of applying the sense of these studies to the broader structures of disciplines, and notes that it is shared understandings in the more broadly defined disciplines that provide the background and rationale for the work done in smaller groups. He says, "theorists tend to attribute the generation and maintenance of such consensus in a field to the influence of three institutions — the field's training programs, its literature, and the university system giving it its power base" (p. 149).

In reviewing studies of disciplines, the growth of their knowledge, and the role of researchers, Pierce notes the importance placed on the literature of a field as a chief means for shaping its directions and building consensus. Through reading or scanning the literature researchers keep up with developments in their fields and in closely allied, or "neighboring" specialties (p. 151). Researchers also contribute to growth in the field by publishing their own work.

On the other hand, the extent of reliance on particular forms and structures of literature varies from discipline to discipline. Variant "forms" of literature include such things as journal articles, books, presentations and audio/visual publications. "Structure of the literature" refers to the way its arguments are constructed. Because the well-known studies of scholarly communication and the development of knowledge concentrate on the work of scientists, the focus of the discussion is often journal literature. Other fields such as education or library science disseminate their work in non-journal publications as well as in journals, which, Pierce suggests for at least the professional literature, is a "symptom and cause of underlying lack of consensus in the field" (p. 159). Because books and technical reports are disseminated less widely than journal literature, they do not unify a field in the same way that the journal literature does. Since the humanities and some social sciences also rely

on and publish books (Broadus, 1987), one might expect a similar "lack of consensus," as expressed by multiple schools of thought. The importance of the literature to the development of a discipline is an indication why inter-disciplinarians would want to develop their abilities to move from literature to literature. At the same time, it becomes clear that part of the equation in getting to a new literature is recognizing that different disciplines rely on various forms of literature and that one model will not serve in ail instances.

Recognition is needed as well of the fact that the literatures of different disciplines have different structures — different ways of presenting arguments and evidence. In his *Shaping written knowledge*, Charles Bazerman (1988) gives specific analyses of some contrasts among the writings in natural sciences, social sciences, and humanities. Bazerman acknowledges that his conclusions cannot be generalized to all individual written works in each of these areas, or even to all disciplines within the areas. Still his analysis serves to highlight the distinguishing characteristics of the different types of writing — e.g., "object under study, the literature of the field, the anticipated audience, and the author's own self (p. 24), in the cases of James Watson and Francis Crick's "A structure for deoxyribose nucleic acid," Robert K. Merton's "The ambivalence of scientists," and Geoffrey H. Hartman's "Blessing the torrent: On Wordworth's later style."

Language differences among disciplines add to the problems of accessing information across disciplines. Depending on the span of knowledge involved in the research, key terms can shift meaning across disciplines (Becher, 1987, p. 261). For example, in English literature, "play" may refer to drama, while in developmental psychology it may refer to a children's activity. Or again, in his "Blurred genres: The refiguration of social thought," Geertz (1980) outlines the analogical use of "game," "drama," and "text" across humanities and social sciences. In the humanities areas, which rely more on interpretation and judgment than the sciences, language often works on several levels, depending on nuances or metaphor as much as on strict meaning. More generally, Bazerman writes: "The words are shaped by the discipline — in its communally developed linguistic resources and expectations; in its stylized identification and structuring of realities to be discussed; in its literature; in its active procedures of reading, evaluating, and using texts; in its structured interactions between writer and reader" (p. 47) At bottom, insofar as key terms guide identification of potentially relevant literature, the researcher or student must be alert to the differing meanings and contexts of similar terms across disciplines.

Given the differences in scope, argument and language among the disciplines, it is reasonable to expect that access to the literature of those dis-

ciplines will also vary. That ways of identifying and locating materials differ across disciplines has implications not only for finding materials from "other" disciplines for a particular topic at hand, but also for identifying and locating works which are themselves interdisciplinary (self-consciously or not).

Forms of Access Literature

Forms of access literature are best understood in the context of the distance from original research. From this perspective, three forms of literature may be identified; primary, secondary, and tertiary. In general, primary literature consists of original research results, reports, studies, and writing (such as essays, fiction, poetry). The distribution of these works may take the form of papers given at conferences, preprints, articles, and/or books.

Secondary literature builds on the primary literature, taking the form of criticism, review, or comment. Published in journals or books (depending on the discipline), it is indicative of the development of research or study. Examples include an article reviewing the literature, or journals devoted to reviews of books, such as *Reviews in American History* or *Choice: Current Reviews for College Libraries*. Another form of secondary literature is access literature, including for example, indexes and abstracts.

Tertiary literature, which is one more step removed from the research process, integrates individual studies and puts them into a context. Tertiary literature often takes the form of reference works such as handbooks, bibliographies or encyclopedias. Although this three-step construction of the literature gives the impression of being sequential, in fact, in the growth and development of knowledge, the levels are interconnected. This is particularly true since today's technology allows multiple linkages among processes of generating, publishing, distributing and providing access to information (Vickery & Vickery, 1987, p. 10).

Access works, a secondary literature, are a kind of meta-literature or map of the literature of the disciplines, either singly or grouped. Among the most common access works are catalogs, bibliographies, indexes, and abstracts, which at minimum provide enough basic information about original works to get the researcher to those books, articles, essays, reviews, etc. Access literature is published in numerous forms, but the most familiar forms are print publications, including books, serials or periodicals; microforms; or machine-readable forms. There is also variation in the way access works are organized, e.g., by author, by issuing agency (particularly important for access to U.S. Government publications and archival collections), by title

(most card and online catalogs allow the searcher to look for a specific title), by subject, by keyword (the *Citation Indexes* Permuterm Subject volumes list each entry by significant terms in the title of each article indexed that year), or by geography (the *MLA Bibliography* organizes its articles by country of the literature). Although organization of the reference work is less dependent on discipline than on the publisher, the subject classification scheme may, indeed, reflect the shape of the discipline. (*Biological Abstracts*, for example, provides various indexes to the abstracts which are organized into broad subject areas: biosystematic using taxonomic categories, genus-species, and author index.) In electronically formatted access works, physical organization is less important than "access points": that is, what the researcher can ask of the database and in what form.

The public organization of information can differ quite significantly from scholars' organization of their own information resources, including books, articles, journals, references, notes, drafts, etc. Public organization is more standardized, dependent on the basic chronology of the development of knowledge and on the need for common access for scholars who are scattered across a country or even among countries. On the other hand, scholars will set up their own files (and/or piles) in any order which enables them to work comfortably and conveniently. It is possible that one's organization may serve a very idiosyncratic thinking process rather than the logic of the subject (Case, 1986)[2]. Such personal translation of information structures is indicative of the problems and possibilities of interdisciplinary work.

Access to Interdisciplinary Literature

Access to interdisciplinary literature involves two separate but related questions: 1) identification and location of useful materials from a literature other than the researcher's or problem's original literature, sometimes known as "imported" (Peasgood & Lambert, 1987, p. 28) — for example, using psychological theories in the development of an ethical theory in philosophy; 2) identification and location of materials that are interdisciplinary, such as the literature of women's studies or biochemistry.

Access works follow the outlines of the disciplines. Thus, there are indexes, abstracts, encyclopedias, handbooks, etc., roughly following the shape of bodies of literature. Specific subfields or cross-disciplinary fields might develop their own access literature, such as *The Public Administration Dictionary, Encyclopedia of Comparative Education and National Systems of Education, Women Studies Abstracts, Sage Urban Studies Abstracts*, or

Ecological Abstracts. For the sake of simplicity, the following will concentrate on catalogs and indexes/abstracts.

A record or entry in an electronic or print catalog or index may have subject indicators, the citation (title, author, journal title, date, pages, publisher), or classification letter/number (Library of Congress or Dewey, indicating its subject or perspective). Often the record will include a description of the work's content (indicative, which mentions the subjects covered; informative, which highlights the content; or evaluative, which is generally found in bibliographies rather than abstracts). In addition, a citation index will indicate interrelationships of the literature by citing the references used in a paper.

Because bibliographic citations are maps of the literature of a field, careful attention to the citations can alert the researcher to issues, language, and sometimes methods of research in a new field. Thus the index or catalog becomes a learning tool as well as a location guide. For example, in the *Philosopher's Index*, over the last ten years (1979-1989), the entries for the subject heading "play" show a wide range of research, from analysis of one or another philosopher, to topics such as work, time, ethics, sport, aesthetics. It was not until 1989 that there was reference to an explicitly feminist article, indexed under "play." This entry could either indicate directions for new research or simply be one more in the range of subjects to which play is relevant.

Subject-oriented access works in print provide help with the language through the use of subject headings, classification schemes, and descriptors used to group citations to books or articles. These terms reduce the need to infer every synonym or form of the term that might describe a particular concept. Thesauri provide lists of these approved terms or phrases, sometimes called "controlled vocabulary", so that the researcher can identify the most useful terminology with which to search access works. Often the thesaurus will also indicate related terms as well as commonly used terms with references to the controlled vocabulary. For example, the ERIC (Educational Resources Information Center) thesaurus which provides subject descriptors for RIE (Resources in Education) and CIJE (Current Index to Journals in Education), uses "play" as a controlled term, as well as "pretend play," "play therapy," "role playing," "recreational activities," and "toys," among others. In contrast, *Thesaurus of Psychological Index Terms*, 5th edition, uses "recreation" instead of "play," but stipulates "animal play," "childhood play behavior," and "play therapy." The term "recreation" lists 19 narrower terms such as "camping," "dance," and "football," and 9 related terms, including "games," "holidays," and "leisure time."

Electronic forms of access also provide such controlled vocabulary but often provide, in addition, broader access through the ability to search any word in a title, list of authors, descriptors, and an abstract when available. "Free text" searching works particularly well when the terms searched are unusual enough to refer to a very narrow range of concepts; it is less helpful when the language can refer to many different concepts. For example, searching "interdisciplinary" in an electronic form of ERIC will identify a narrower range of articles than "discipline," which will refer not only to fields of study ("Humanities researchers experience a 'sea change' in the use of computers in their disciplines,") but to classroom management ("Stopping discipline problems before they start"). "Competition" will be less specific than "agôn."

The choice between using controlled vocabulary or free text in electronic forms of access may come down to a decision between "recall" and "precision." In general, a strategy which relies on searching only controlled vocabulary leads to a higher degree of precision; the topic requested will be the subject of the documents retrieved. However, since controlled vocabulary is assigned by indexers who decide which terms to use, assignment of subject terms is a matter of judgment and conditioned by the time available for indexing. Therefore indexes vary in the number of terms generally assigned as descriptors or subject headings, leaving open the question of completeness of subject description. It follows that attaining higher precision runs the risk of missing literature which could be considered relevant by the researcher. This is particularly true for researchers who are moving from one discipline to another, and for whom the relevance of the literature might be due to relatively minor aspects, or what the work exhibits rather than what it says — as opposed to its main subject or themes.

In order to have more confidence in the completeness of their searches for relevant literature, many researchers prefer to broaden their search, increasing the numbers of citations retrieved, thus achieving a higher level of recall. They are willing to cull through numerous citations of no use in order to increase their chances of finding a crucial work that might not show up in narrower searchers. To achieve higher recall, they will use free text vocabulary as well as descriptors in their searches. For example, a researcher wanting information on the meaning of play in culture might do a computerized search for the terms in databases covering the social sciences and humanities and risk numerous articles on the "role culture plays in child development," etc., in order to get other articles in which there is a mere mention of the relationship between the concepts of play and culture.

Literature which is itself interdisciplinary poses particular problems of access, because it is at once of a piece with particular disciplines and engaged in its own growing conversation(s). For instance publications in women's studies are found in journals focused on that field as well as in publications in psychology, literature, and business. Researchers get access to these literatures through disciplinary indexes and catalogs as well as multi-disciplinary ones. Examples of the latter indexes include the Wilson indexes (*Humanities, Social Science, General Science, Applied Science and Technology*, etc.) which cover a selected group of journals; and the ISI Citation Indexes (*Science, Social Science*, and *Arts and Humanities*), which cover specialized research journals. These indexes are not necessarily about interdisciplinary work; instead they gather together citations to works from a number of disciplines, making it easier to move from one discipline to another.

As the literature grows that is specifically about interdisciplinary theory, pertinent subject headings may be developed, particularly in the Wilson Indexes which have a fairly quick response time to developments in language and concepts. For example, the *Humanities Index* introduced the headings, "interdisciplinary approach in education" and "interdisciplinary approach to knowledge" during 1983/84, after using "interdisciplinary cooperation" for some years. Article or book titles using an interdisciplinary term can more easily be located in a citation index or through electronic keyword search, for example the government publication, *Interdisciplinary investigations of the Boott Mills, Lowell, Massachusetts*. On the other hand, if researchers are moving from examples or cases of interdisciplinary work to generalizations or theory, they may not find "interdisciplinary" terminology included in title, subject heading or descriptor, or even the abstract. For example, *Eight hours for what we will: Workers and leisure in an industrial city, 1870-1920*, is tagged as interdisciplinary only in the series title, "Interdisciplinary perspectives on modern history," which may or may not be searchable in an individual catalog. It becomes important that researchers identify the kinds of literature that would tend to turn up the citations needed. For example, Geertz's article (1980) was indexed in the (print) *Humanities Index* under the heading "social thought." It is not clear that someone interested in emerging interdisciplinarity would find that article, were there not some other avenue to it or foreknowledge that the area of social thought was pregnant with cross-disciplinary possibilities.

Citation indexes guide researchers through bibliographies of articles, allowing them to move forward in time from an article as well as backward (bibliographies look to the work which provides the basis for the article in

question; citation indexes show how the article in question has been used by others and how the author has developed his or her own work). Although one must be wary of the use of citation indexes (MacRoberts & MacRoberts, 1989), at least one study indicates that citation retrieval may be more effective than controlled vocabulary for identifying relevant documents in new interdisciplinary areas in medicine (Goffman & Pao, 1980, cited in McCain, 1989, p. 110). In her own recent study, Katherine McCain (1989) compared descriptor and citation searches for documents that were both relevant and novel (previously unknown) to those posing a research question. The searches included such topics as intervention to prevent parents neglecting high-risk infants, learned helplessness (reactions of humans and animals to stress), interpersonal problem solving, and language dysfunction associated with Alzheimer's disease.

McCain found that searches using descriptors successfully identify relevant documents when the "… indexed documents are 'about' well established research topics with readily recognized concepts and relatively standardized terminology…." (p. 113). She notes that "high-risk infants" is such a topic. In contrast, citation searches are successful

> [if] at least a few documents [are] key contributions to the research topics …, [if] the importance of these articles [isl generally recognized by researchers, [if] the norms of scholarship require citation of these key contributions, and lastly [if] sufficient time [passes] after publication of the key articles to generate a body of citing work (p. 113).

McCain found that "learned helplessness" is an example of a topic successfully searched through citations.

McCain found, further, that when the results of both descriptive and citation strategies overlapped, there was also little difference in the percentage of documents that the researcher had not seen (p. 113). When there was little overlap in the results of the two strategies, there was a higher percentage of novel documents identified by each of the strategies, thus indicating two separate but equally relevant literatures: one based on subject terms, but with different background literature, and the other based on a set of commonly cited authors who use different subject matters and terms (pp. 113-114).

If McCain's work could be applied to other areas, then to the extent that the growing literature of interdisciplinarity shares a common language, which in turn is recognized not only by the scholarly community working in those areas but also by those who identify and index that literature, then retrieval by subject terms will achieve a satisfactory level of access. To the

extent that there is a recognized scholarly community working in interdisciplinary issues, then citation indexing will also achieve satisfactory document retrieval. Thus in my original three categories of interdisciplinary work, one might expect high levels of retrieval of relevant documents through both subject and citation searches in the second category — that of well-defined interdisciplinary subjects, such as American Studies or environmental studies. In the area of interdisciplinary theory, one would expect a less satisfactory level of document retrieval. In part this reflects failure to index some publications, for example, *Issues in Integrative Studies*. In part, too, retrieval problems affecting interdisciplinary theory are due to the diversity of publication outlets. To give a simple example, Bazerman's *Shaping written knowledge* is classified as technical writing by the Library of Congress, while Becher's "Disciplinary discourse" appears in a higher education journal. Fortunately, Becher and Bazerman do cite each other's work. Finally, the third category of idiosyncratic literature, the application of a theory of one discipline to a topic in another, will be the most difficult to identify by either of the two strategies.

Up to this point, I have been dealing with the structure of disciplinary and interdisciplinary literature and access to these literatures. The other, and equally important, aspect is the work of the researcher. A scholar or teacher looking for information in interdisciplinary areas will be more effective by knowing the structure of the literature and how to use various access tools. However, for any individual's work, a key issue is what kind of information is being sought and its proposed use. Closely related is the researcher's own style of intellectual work.

The Researcher's Approach

The goals of teachers and scholars in interdisciplinary areas include providing ways for students to learn (and to learn how to learn), and contributing to new knowledge in their fields. Since various research projects contribute to those goals, identifying and finding information is part of the research. Understanding the structures of the universe of information resources helps researchers be more effective in their searches for information. But that is not the whole story; a central question is the very practical and personal one of meeting the individual's immediate information needs.

Individual researchers may have various kinds of information questions across disciplines during a research project. What they look for and how they frame their questions depend on what they already know, as well as on assumptions about what count as worthwhile questions, what kinds of infor-

mation are likely to help them, and what kinds of arguments are acceptable. As the work of Bazerman and others implies, much of this will be dependent on their "mother-disciplines."

Examples of the questions researchers ask range from the very inchoate ("I'm interested in something in the area of…..") to the more focused ("I want to find out more about how this psychological theory might be helpful in the study of…..") to the very concrete ("I heard of a good article on this topic, by someone named…..."), all of which can be very productive approaches to research. Strategies differ for each of these questions, ranging from "fishing" (using all kinds of information resources, including talking to colleagues), to bibliographic searches in print or online, to a straightforward citation identification. Researchers decide which approach to use by taking into account the amount of information needed (comprehensive or selective), the amount of time they are willing to spend, the cost, and the availability of resources.

The researcher or student must weigh the advantages and disadvantages of each form of information search. They will find that electronic databases provide a great deal of flexibility with relatively little time expenditure, and as more of these indexes and abstracts become available on CD-Rom² or through local computer systems, researchers pay little or no direct costs for the searches. However, using electronic databases can be a little like working with blinders on: they search only the strings of characters they are given. Again to use "play:" out of context the word can refer to any number of things: sports, toys, children, drama, activity, social roles, etc. Ultimately, it seems to me that the difference between being able to articulate, in contrast to being able to recognize, is important in research. A person may not be able to come up with words or expressions, or to articulate what he or she wants, but when it is offered or stumbled on, it is recognized as important and worth pursuing. While browsing is possible on some electronic tools, these tools are more responsive to the searcher's ability to articulate.

Researchers using the more familiar print resources invest more time and have less flexibility of access than that available in electronic forms: incorporating new strategies in mid-stream can be very time consuming. However, taking the time to browse, skipping around according to whim, letting things pop up off the page can be very fruitful in research. This is the antithesis of wearing blinders — and is what I often think of as "peripheral vision." Examples of this phenomenon tend to be personal. Some years ago, Stephen Miller's (1973) "Ends, means, and galumphing" jumped off the page at me because of its playful title. More recently, a colleague happened to mention the quite helpful Bazerman book, after he noticed it on the

library's new book shelf. Other scholars might find these materials in more conventional or structured ways.

To be able to take advantage of the strengths of all the systems that are available requires flexibility of thinking. In brief, it means being able to identify what one needs at the time (in general terms), and being able to figure out an approach to finding it — including kinds and forms of resources to give it and what kind of language to use. One approach I have found helpful is to ask, "What are the variety of ways that one could think about this question?" Huizinga (1950) provides an illustration in his examination of the role of play in culture, looking at play and law, war, knowing, poetry, philosophy and art. One could ask how play is found in cultural activities, and one could also ask how such activities influence the value a society places on play. One might examine popular metaphors that have a "play" basis. And so on. Such an approach allows the researcher to break open usual categories, think of the question in fresh ways, and "see the familiar with unfamiliar eyes" (Bruner, 1976, pp. 18-30). In the end, one may find it possible to consider resources outside the most obvious or familiar as possible contributors to one's knowledge of a subject.

Numerous works have been written on creativity, with a view toward developing new knowledge, but not necessarily about ways of finding information. David Bawden (1986), however, has written specifically to that question, and outlines several techniques, including synetics, brainstorming, morphological analysis, and lateral thinking (pp. 206-207; see also Buzan, 1983, pp. 86-115). Perhaps one of the assumptions held by researchers in some fields is that the search for information is "simply" ancillary to real scholarship, the development of new knowledge. Indeed that is true for certain kinds of information searching. However, the originality that scholars try to achieve is not only in the finished product, but in the search for the information or knowledge which is the basis for these new ideas.

Looking for examples is one such search. Floating around in scholars' heads are images, events, sentences, that, because of their compactness, grace, or wit, would make good examples. Or they might have ideas that need examples. In the latter case, searching the memory for direct or indirect associations, browsing among files, catalogs, indexes, or making up images or events to see if they work can evoke original thought This is because examples can work in two directions: they can illustrate or apply the idea; but they can also help develop or further the idea.

Directions

The student or researcher who wants to find information or literature across disciplines must develop some expertise in moving around the assumptions, the structures, and the varying literature of the disciplines. Even seemingly common language among them cannot be taken for granted. The language and tools of access are either congruent with the disciplines or are too general to be of detailed help. Given the less than adequate current classification schemes for information (Weinberg, 1987), what are some directions for scholars working in interdisciplinary areas?

One approach for the individual is gradually to acquire more expertise and familiarity with the structures of information resources. Another approach, which an association such as the Association for Integrative Studies may wish to organize, is to begin actively shaping the resources to meet the needs of interdisciplinary scholars and students. The following suggestions are ways to provide better access within the current framework of such information resources:

1) Develop more journals specifically for interdisciplinary work which would help reduce problems due to scattering of literature. The advantage of having a breadth of publication outlets must be weighed against economic and political considerations. Journals are expensive, and given the large numbers of publications already available, there is a serious question whether enough people and institutions would subscribe to make them financially viable. There is also a political risk: until such journals become established, scholars who wish to work in interdisciplinary issues but who are working toward institutional tenure and promotions may instead choose narrowly disciplinary outlets for their articles.
2) Explore ways to alert indexing and abstracting services to journals and other forms of interdisciplinary literature and to the kinds of language necessary to get access to the literature. The Association might wish to initiate discussion with selected publishers offering its services to help improve access to interdisciplinary work.
3) Set up an indexing or abstracting service which covers only interdisciplinary literature. Although those developing such an index would have to deal with the issues raised in the earlier parts of this paper, it would be a means to integrate materials from a broad range of scholarship. Again, the economic dimension must be considered, since providing intellectual access to literature is labor-intensive, and therefore costly.

4) Develop a publication for an annual review of literature.[3] Publishing in this form has the advantage of using experienced interdisciplinary scholars to review, evaluate, and write for designated areas. The labor involved is shared and builds on the expertise of the interdisciplinary "invisible college."

5) Authors working in interdisciplinary areas might consider titling their books and articles so that the cross-disciplinary or integrative aspect of the work is conveyed. Similarly, if asked to write an abstract for their own articles, they may consider not only what information to include, but the terminology which will aid effective interdisciplinary identification of that article.

6) The Association could develop a taxonomy or thesaurus of interdisciplinary work, which would provide a foundation for numerous forms of access. Members with expertise in various disciplines and in ways of crossing these disciplines could identify categories for organizing interdisciplinary work.[4]

No doubt it is clear that none of these suggestions will solve all the problems, but taken together they might provide starting points for further discussion of access issues.

Perhaps if researchers were asked to articulate their ideal information access systems, they would want to be able to effectively and efficiently identify literature or research in any discipline that would be relevant and important to their own work. At first glance, this seems a valid ideal, but it is worth considering whether such an ideal is incomplete, if not misguided. There are two considerations: 1) the question of what counts as "relevant" and 2) the question whether the value of "techniques" is necessarily limited.

While information retrieval is often an attempt to find something already written that is relevant, it is also a way to make connections, to make one thing relevant to another. For example, to explore the role of play in creative thinking, a scholar could look for examples of research connecting play and creativity, using any of the methods mentioned above. On the other hand, in accounts of creativity, there are patterns of discovery called dreams, model building or idle talk which can be reinterpreted as play. Such conceptual reconstruction allows the researcher to develop a thesis about play and creativity. Since developing new knowledge is a subjective construction of ideas as well as a discovery of what is objectively connected, there is no guarantee that one could always identify personal relevance before the fact (Swanson, 1986a; Wilson, 1973).

There is a tendency to look for formulae or recipes for certain activities, and such techniques are helpful when they can streamline unnecessarily complex processes, freeing one for that which requires judgment and reasoning. The question is whether information searching is an activity that is simply routine or whether it is something that calls for judgment. Clearly it can be either. I would argue that developing routines is very helpful for basic information needs, and it is well to develop easily used techniques for those areas. I would also argue that there are areas of research or levels of information need that demand a higher level of judgment, and that trying to formalize these necessarily limits the results the researcher will achieve.[5]

Therefore, although efforts to improve conceptual access to information across disciplines are worthwhile if they serve the teaching/ learning and research processes, they shouldn't be confused with reducing those processes to a simple technique.

Conclusion

Setting the problem of access to interdisciplinary works highlights several areas of research and study. For individuals who need to identify interdisciplinary work for their own study and teaching, the issues are 1) understanding the structures of the disciplines into which they wish to move, including the various access works and tools; 2) thinking flexibly about these areas and their own research questions. For those interested in interdisciplinary theory, there might be some fruitful research projects to be developed in the areas of scholarly communication among "interdisciplinarians," identification of intellectual indebtedness through citations within and among interdisciplinary fields, and the coherence of scholarly vocabulary in these fields. And finally, the Association for Integrative Studies may wish to initiate the development of review articles, indexes, or databases, and a thesaurus to provide access to interdisciplinary work, either building on the forms already available or developing a new form peculiar to integrative work.

Notes: I am grateful to the reviewers of this article for their comments and criticism, which have added to its clarity.

Biographical Note: Joan B. Fiscella is Bibliographer for Professional Studies and Assistant Professor at the Library of the University of Illinois at Chicago. Her previous positions as librarian include Head of Business Relations and Business Reference Liaison at Auraria Library, Denver, and Head of Information Services at the University of Houston Libraries. Prior to receiving her AMLS at the University

of Michigan (1983), she taught in humanities interdisciplinary programs as a faculty member at University Studies/Weekend College Program, Wayne State University, Detroit, and at Mary Manse College, Toledo, Ohio. She received her Ph.D. in philosophy from the University of Notre Dame (1977).

Endnotes

1. This is the lure of hypertext programs which allow databases to follow individual connections instead of standardized ones. "Hypertext" refers to computer programs which allow links to be made between different parts of databases or among records in various databases. The database user can, at any time, pull to the screen other material related to what is on screen without exiting the first database or record and entering another. The individual makes whatever connections he or she finds necessary. For example, while using a text on computer one could bring up a definition or illustration of a concept or even a related article, simply by pressing a button. On the other hand, that person may, at another time, simply choose to ignore the links. Apple Computer's "HyperCard" and Owl International's "Guide" are programs based on the principles of hypertext.
2. CD-Rom is an acronym for compact-disk, read-only-memory, and refers to electronic optical disks which can be searched using personal computer-based players.
3. I am grateful to Rutherford Witthus, Head of Archives and Special Collections, Auraria Library, for his suggestion for this kind of publication, as well as numerous conversations about interdisciplinary issues.
4. A recent example of an interdisciplinary thesaurus is Capek's (1987) *A Women's Thesaurus*, which could provide the model for the Association's work. The impetus for this paper came from a discussion with Stan Bailis about the frustration of not having a language which would support the search for literature needed by students and researchers in interdisciplinary programs.
5. Two works have influenced my thinking on this: Hubert L. Dreyfus and Stuart E. Dreyfus, in *Mind over machine: The power of human intuition and expertise in the era of the computer* (New York: The Free Press, 1986): 16-35, who indicate that the knowledge involved in "expertise" takes one beyond analytic reasoning. The other is William Barrett, *The illusion of technique: The search for meaning in a technological civilization* (Garden City: New York: Doubleday, 1978).

Bibliography

Barrett, W. (1978). *The illusion of technique: A search for meaning in a technological civilization*. Garden City, NY: Doubleday.
Bawden, D. (1986). Information systems and the stimulation of creativity. *Journal of Information Science, 12*, 203-216.

Bazerman, C. (1988). *Shaping written knowledge: The genre and activity of the experimental article in science*. Madison: University of Wisconsin Press.

Becher, T. (1987). Disciplinary discourse. *Studies in Higher Education, 72*(3), (1987): 267-274.

Beniger, J.R. (1988). Information and communication: The new convergence. *Communication Research, 15*, 198-218.

Broadus, R.N. (1987). Information needs of humanities scholars: A study of requests made at the national humanities center. *Library and Information Science Research, 9*, 113-129.

Bruner, J.S. (1976). *On knowing: essays for the left hand* (reprint ed.). New York: Antheneum.

Buzan, T. (1983). *Use both sides of your brain* (rev. ed.). New York: E.P. Dutton.

Capek, M.E.S., ed. (1987). *A women's thesaurus: an index of language used to describe and locate information by and about women* (First Perennial Library edition, 1989). New York: Harper & Row, Publishers.

Case, D.O. (1986). Collection and organization of written information by social scientists and humanists: A review and exploratory study. *Journal of Information Science, 12*, 97-104.

Dreyfus, H.L., & Dreyfus, S.E. (1986). *Mind over machine*. New York: The Free Press.

Geertz, C. (1980). Blurred genres: the refiguration of social thought. *American Scholar, 49*(2), 165-179.

Heim, M. (1987). *Electric language: a philosophical study of word processing*. New Haven: Yale University Press.

Huizinga, J. (1955). *Homo ludens: A study of the play-element in culture* (First Beacon Paperback edition). Boston: Beacon Press.

Klein, J.T. (1989). *Interdisciplinarity: history, theory, and practice*. Detroit: Wayne State University Press.

Kyle, B. (1958). Towards a classification for social science literature. *American Documentation*, 168-183.

MacRoberts, M.H., & MacRoberts, B.R. (1989). Problems of citation analysis: A critical review. *Journal of the American Society for Information Science, 40*, (5), 342-349.

McCain, K.W. (1989). Descriptor and citation retrieval in the medical behavioral sciences literature: retrieval overlaps and novelty distribution. *Journal of the American Society for Information Science, 40*, 110-114.

Mclnnis, R.G., & Symes, D. (1988). David Riesman and the concept of bibliographic citation. *College & Research Libraries, 49*, 387-399.

Miller, S. (1973). Ends, means and galumphing: some leitmotifs of play. *American Anthropologist, 75* (1): 87-98.

Newell, A. (1983). Reflections on the structure of an interdiscipline. In F. Machlup & U. Mansfield (Eds.), *The study of information: interdisciplinary messages* (pp. 99-109). New York: John Wiley & Sons.

Peasgood, A.N., & Lambert, P.J. (1987). Multi-user subjects, multi-subject users: Reader-defined interdisciplinarity in journals use at the University of Sussex. *British Journal of Academic Librarianship, 2* (Spring), 20-36.

Pierce, S.J. (1987). Characteristics of professional knowledge structures: Some theoretical implications of citation studies. *Library and Information Science Research: An International Journal, 9*, 143-171.

Schwab, J.J. (1962). The concept of the structure of a discipline. *The Educational Record, 43*, 197-205.

Small, H. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents. *Journal of the American Society of Information Science, 24*, 265-269.

Swanson, D.R. (1977). Information retrieval as a trial-and-error process. *Library Quarterly, 47*,128-48.

Swanson, D.R. (1986a). Subjective versus objective relevance in bibliographic retrieval systems. *Library Quarterly, 56*, 389-98.

Swanson, D.R. (1986b). Undiscovered public knowledge. *Library Quarterly, 56*, 103-118.

Vickery, B., & Vickery, A. (1987). *Information science in theory and practice*. London: Butterworths.

Weinberg, B.H.   (1987). Why indexing fails the researcher. In C. Chen (Ed.), *Information: Transformation of society: Proceedings of the 50th annual meeting of the American Society for Information Science held in Boston 4-8 October 1987* (pp. 241-244). Medford, NJ: Learned Information, Inc.

White, H.D., & Griffith, B.C. (1981). Author cocitation: A literature measure of intellectual structure. *Journal of the American Society for Information Science, 32*, 163-171.

Wilson, P. (1983). Bibliographical R&D. In F. Machlup & U. Mansfield (Eds.), *The study of information: Interdisciplinary messages* (pp. 389-397). New York: John Wiley & Sons.

Wilson, P. (1978). Some fundamental concepts of information retrieval. *Drexel Library Quarterly, 14* (April), 10-24.

Wilson, P. (1973). Situational relevance. *Information storage and retrieval, 9*, 457-471.