50th Anniversary Feature—

The Structuring of the Scholarly Communication System

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This article is both a primer to the subject of scholarly communication as a system and a summary of its present status. In tracing the broader aspects of the development of this system, the principles and innovations of librarianship throughout the ages are presented as essential to the structuring of the system's adherence to the most fundamental principles of science and scholarship.

The management of academic library services assumed a vast new dimension of complexity when our profession concluded that its business is foremost the provision of access to information. For this seemingly simple conclusion implies that the management of academic libraries must look more deeply than ever before into its kaleidoscopic environment to fathom the most fruitful approaches to this singular, yet nebulous, goal. Like the *bourgeois gentilhomme*, who discovered that all his life he had been speaking prose, we have discovered our place in what now is called the scholarly communication system. The system is not new, of course, any more than is the role libraries play in it.

The terms *scholarly communication* and *system* have not always been used together; moreover, the former phrase is of relatively recent coinage. It is entirely fitting that those two words be combined to create a special significance, however, because words with the "scholar" root are derived from Greek through the French *scholies*, meaning critical notes or footnotes. Thus, scholarly communication is well rooted in the concept of documented communication. That this communication functions in a system was both a premise and a conclusion of the American Council of Learned Societies' report on the subject, commonly referred to as the National Enquiry.[1] The present understanding of the phrase *scholarly communication system* may not have been advanced first in the National Enquiry report, but the phrase clearly gained acceptance as a result of its use in that document. Scholarly communication behaves as a system, that is, a group of components that are influenced by each other as well as by the group's environment, each component serving as the environment of a subsystem. Major components of the scholarly communication system are the scholars and scientists who initiate communication, publishers, librarians, and the scholars and scientists who receive that communication. Bearing in mind that this system overlaps others and that each component is a system itself, this brief description omits, although implies, many complexities.

Literature on scholarly communication has been scattered and incohesive until very recently because this type of communication has not been examined very frequently as a system. Each of the components is surrounded by a corpus of litera-

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ture, to be sure. But because of the synergistic nature of systems, the sum of all the information about each component does not present a holistic picture of the integral system of scholarly communication. That remains to be done. An excellent beginning has been made by Herbert Morton and others, who have assembled an annotated bibliography of studies on aspects of each component.[2] Arranged in eleven chapters, the work opens with an extensive essay on the literature of scholarly communication. Whereas the Morton critical bibliography emphasizes the humanities and social science components of the system, P. J. Hills devotes more attention to the sciences and technology in a survey article, whose bibliography complements Morton's quite well.[3]

The present paper is intended to provide a comprehensive, yet general, description of the evolution of the scholarly communication system to its current stage, with special attention paid to the fundamental principles that drive the system. In examining both the formal aspects of scholarly communication and the current transitional phase of its system, it is further intended for this paper to show that the system has gained its structure and continues to restructure itself through the influence of relevant principles of and advances in librarianship—that librarianship has consistently opened the portals of opportunity for scholarly communication and advanced the system to more sophisticated levels.

FUNDAMENTAL PRINCIPLES

The Scientific Model

Owing to the prominence achieved by the physical sciences throughout the centuries and especially during our own, it has become nearly impossible to contemplate the principles behind any organized pursuit of natural truth without comparison to the standards established by science. And it is precisely through the principles of science that refer to replicability and to critical debate by the scientific community, principles that are second in importance only to objectivity, that the role of communication stands out as an essential characteristic of science.[4] Without communication there is no science. Only when theory or discovery is either validated or invalidated by the scientific community has science taken place, and that is a process of communication.

Variations

Scholarship outside of science incorporates many of the principles of science and, in the end, is validated through a process of communication very similar to that of science, but lacking its apparent conclusiveness. That difference has more to do with differences between the subjects of inquiry than with the principles of inquiry, however. Scholars in all fields document their work so that others can retrace their processes and so that they can refer to influential support in areas that are not a part of accepted knowledge or that otherwise represent an unproved hypothesis advanced by the scholar. The degree of emphasis given to one over the other of these purposes for documentation varies by field of inquiry, but in all cases documentation is an explicit expression of the principle of communication.

All fields advance on similar bases. Discoveries must be described for others in the community so that they can be observed or verified in some other way and so that they can be made relevant to the advancement of knowledge in the field. Theory and interpretation have as their purposes the enhancement of knowledge and the stimulation of further inquiry at a new plateau that provides a new perspective on the subject. Experimentation and the accumulation of a coherent body of facts are functions that are similar to each other insofar as their purpose can be either to test theory and interpretation or to prepare the way for such activity. The synthesis is a record of the status of accepted fact, theory, and interpretation, whose purposes can be as varied as its readership; but it is a very formal communication.

Peer Review

Motivating all of these aspects of scholarly communication (discovery, theory, interpretation, experimentation, accumulation of fact, and synthesis) is the individual's drive for acceptance by the peer community. For it is through peer acceptance that the scientist or scholar achieves suc-

cess and that knowledge advances. The two results are inseparable. Therefore, the principle of peer review is of utmost importance in the scholarly communication system.

As it is commonly understood, peer review is the process whereby authorities in a given field determine the validity and assess the relative significance of a particular contribution of a scholar or scientist within that field. Peer review is a very formal process of communication within a closed society of experts, a process that is undertaken both for and by that closed society. Whether this formal process is carried out on printed paper or simply through word of mouth, or by any other medium, it determines in large measure the extent to which subsequent scholarly communication will surround the contribution in question. Therefore, peer review is central to scholarly communication and implicit in anything to be discussed about scholarly communication in this paper. The subject of much debate ever since the awakening of modern science, peer review has been examined most recently by Stephen Lock, whose study includes a comprehensive review of the literature on the subject.[5]

Publication

Peer review finds its broadest formal expression in the process of publication, first because editorial review by experts often is required prior to acceptance for publication and, second and most obviously, because the contribution then is presented to a much larger audience of specialists and others. Although for several centuries the verb "to publish" has had a very specific meaning, it is useful to bear in mind in this connection the more general meaning of its direct Latin root *publicare* (to make public). As we will see later in this paper, the growth of electronic scholarly communication media may very well suggest a return to the more general root meaning of publish. In sum, just as communication is an essential ingredient in science and scholarship, so is publication a fundamental vehicle of that communication.

STRUCTURING THE SYSTEM

The scholarly communication system is not a twentieth-century invention any more than is scholarship. As a system it began with loosely connected components and underlying principles that were woven more and more tightly together by structuring forces over many centuries. An overview of the evolution of this structural system should provide insight into the nature of the system in its present state. Rather than attempt to describe the most rudimentary elements of the scholarly communication system such as language and writing, this paper will address some of the influential forces that have shaped the system.

Libraries

When scholars began to communicate in writing they in effect began documenting their work and their communication. Libraries were created to facilitate the diffusion and the preservation of that communication and to further its growth. Thus, the library was intended to be a place for scholars to congregate; a nucleus of communication, both oral and written. Enhancing this purpose was the principle, associated most frequently with the Alexandrian Library, of compiling a complete record of the achievements of humanity. All of the functions that can be imagined for the research library of the twenty-first century were imagined by the third century B.C., only with greater simplicity and clarity. That early library was more than a physical site; it was the conceptual framework for a system. The history of academic libraries, viewed from this perspective, remains to be written.

Printing Press

The invention of the printing press in the fifteenth century stimulated the need to further structure the scholarly communication system in response to the many ways in which printing altered both the volume of scholarly communication and its substance. It not only made available a much greater number of texts, but also gave greater assurance to their uniformity and dependability. Improved uniformity then led to the practicability of the alphabetical index, a direct aid to scholarship, and encouraged information exchange among scientists of different coun-

tries, who then could accumulate information faster and more reliably. These changes brought with them a greater receptivity to new ideas and the acceleration of progress. It was with the rapid adoption of the printing press by the scholarly and scientific community that the present relationship between scholars and publishers established itself and that economics began to play a role of some importance in the process of scholarly communication. The influence of the printing press on scholarly communication is analyzed very thoroughly by Elizabeth Eisenstein.[6]

Learned Societies

In the seventeenth century scientific and scholarly associations began to flourish. Their original purpose was to facilitate and enhance communication among scientists and scholars, with the scientific organizations providing the model for others. By the nineteenth century learned societies had assumed the added responsibility of representing their respective fields to the public, and by the middle of the twentieth century that role had expanded to include political activity in the interests of the advancement of the field. The learned society created a manageable forum for critical debate and peer review, achieving the ultimate function, in that regard, of publishing both books and journals. Not only was society publication a logical development, it also was a response to the increasing difficulty of persuading a commercial publisher to publish information that would attract relatively few sales among the general public. The learned society facilitated communication as well through periodic convocations of its membership, at which time papers would be read and ideas exchanged through conversation, much as such gatherings function today. But the most significant contribution of the learned society to scholarly communication clearly was its establishment of the journal roughly 325 years ago.

The Scholarly Journal

Letters that scholars circulated among themselves to describe their activities were the antecedents of the journals established in the middle of the seventeenth century in France and England. Journals could perform the same function, but they could also reach a much broader readership simultaneously, and were well suited to reporting experimentation, which was becoming characteristic of modern science and which required publication of relatively short reports in installments. The scholarly journal embodied all of the principles important in scholarly communication and, more generally, encouraged research and enhanced communication. Attesting to these more general functions of the journal is the startling increase in its numbers. With the inclusion of book reviews, the journal even made it possible to stay abreast of scholarly book publication, which had accelerated due to the printing press, the learned society, and the general stimulation to scholarly activity afforded by the journal.

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Much has been written about the journal, for it is the most characteristic expression of the spirit of science and scholarship, and its history reflects the evolution of science and scholarly research. The processes of the journal are largely responsible for the cumulative nature of the sciences and for the integration of scholarship in the humanities.[7]

The Library Catalog

Due to momentum generated by the printing press, the learned society, and the journal, the scholarly communication system became very dynamic. The system had purpose, in terms of its principles; it had energy, in terms of the substance of communication; and it had mechanisms, in terms of the printing press and the formats made practical by it. What the system lacked was structure, the element that renders the system coherent and usable. The library brought to the system that nec-

essary element to ensure that the system created by scholarship would work for scholarship, to ensure that as energy and momentum increased the purpose of the system would not be forgotten. The library accomplished this through the collection, organization, and preservation of the vehicles of scholarly communication. But it also went well beyond these functions by creating the library catalog.

The Alexandrian Library was the site of the first known attempt at a library catalog on a large scale, which entailed considerably more than a simple listing of author and title. Subsequent refinements in the catalog are well known: the shift from lists to files of cards for ease of consultation and updating, standardization of bibliographic description, establishment of name and subject authorities, and development of the online catalog with a variety of points of entry. These advances have put order to what otherwise would be chaos, thereby ensuring the continuity of scholarly communication over space and time.

The library catalog also became the model for other structuring forces in the system. They are the bibliographies, the indexes, and the abstracting services that apply to subject fields, books, and journals the principles of the library catalog. The library catalog and its derivatives comprise a part of the system's structure that reflects the dynamism of the entire system.

Professionalization

Of the major forces that have given shape to the scholarly communication system, one was a social phenomenon of considerable influence. That is the professionalization of science, scholarship, and librarianship.

Among the effects of the Industrial Revolution were the development of a keen awareness of the need for specialized knowledge and the establishment of a strong movement toward institutional egalitarianism. These new directions led to the expanded provision of higher education to classes of society which previously were unassociated with academia and which then began to answer the call for leaders prepared with deeper and more specialized, usable knowledge. This thrust toward training to meet the rapidly changing needs of industry and society and, through that channel, to improve the individual's status helped bring about a far greater departmentalization in universities than had been known before. It was at that time that the Ph.D. became the accepted requirement for university teaching, which constitutes another step in the direction of specialization. That requirement had a concomitant effect, for it implied very serious commitment to scholarship in a particular field. No longer would science and scholarship rest in the hands of the amateur. Science would from that time forward be the enterprise of industry and academia, while academia would become the sole residence of humanities scholarship. The population involved in the scholarly communication system thereby became better defined.

As we know very well, the trend toward specialization has continued through the twentieth century, as has the democratization of academia. Academia has become a pluralistic institution wherein individual success is based on individual merit, which is judged foremost in terms of scholarly communication. Consequently, individual scholars and scientists identify more closely with their disciplines within the scholarly communication system than they do with the institution in which they are situated. That attachment has been reinforced consistently by improvements in the ease of travel to attend meetings and to consult libraries and by advances in means of communication, such as telephone networks, postal services, and telefacsimile machines.

Much was also done to facilitate academic scholarly communication by the professionalization of librarianship beginning near the close of the nineteenth century. Elementary principles and structures created centuries earlier were made more sophisticated in anticipation of the ways in which the system might be addressed. In fact, an examination of the cataloging rules changes of the twentieth century might even suggest that the professional endeavor toward perfection was pursued to a fault in constructing a research tool so complex that its great power

could be put to full use by relatively few scholars. Nonetheless, the rapid progress of all aspects of librarianship during this century is due largely to the professionalization of the field.

A New Subsystem

Science and scholarship have flourished throughout the ages commensurate with the level of sponsorship they have been accorded. Centuries ago, those scholars and scientists who were not of independent means sought patronage. Later, universities sponsored their work by providing them income, a place to engage in their intellectual pursuits, and the time to do so. In the middle of the twentieth century, particularly in the United States, World War II became the stimulus for the establishment of an unprecedented partnership between academia and the federal government, based on sponsored research. That new partnership quickly became so successful by generating new energy in the scholarly communication system that a new subsystem was created.

Research in weaponry was of the highest priority in the United States during World War II. Toward the goal of attracting the greatest number of the nation's best scientists to conduct research in weaponry, an arrangement was devised whereby the government would financially sponsor, through contracts and grants, research in that area and in other areas of interest as they emerged. The process was built upon the principles of peer review, as developed in science, and of meritocracy, as adopted in academia, and it soon made of academic research a large enterprise in the eyes of the government and an influential force in academia. This new partnership between government and academia was nurtured by a synergism that yielded results for the government and burgeoning sources of support for academic research, eventually in nearly all disciplines. Among the government agencies that have fostered this relationship are the National Science Foundation, the National Endowment for the Humanities, and the Office of Education, all of which recently have been directing increasing support to the maintenance and strengthening of the scholarly communication system. The latter effort has contributed greatly to large-scale information networking, preservation of library materials, cataloging of library materials and expansion of national bibliographic databases, and innovative employment of information technologies. Because of the symbiotic nature of the relationship that has developed between academic research and the U.S. government, and in consideration of both the magnitude of the research efforts it encompasses and the interaction it has with the rest of the scholarly communication system, this new partnership can be considered to function as a subsystem.

The Computer

When the computer and ancillary information technologies were applied to an overburdened and perhaps outmoded system of scholarly communication, a new age was heralded. It was soon discovered, however, that the solutions to old problems, which were reduced in severity by the computer, were counterbalanced by the introduction of a new set of difficulties brought about, ironically, by the great potential of the computer. The advent of the computer had such jolting impact on scholarly communication, primarily because of the swiftness of change it generated, that it is very largely responsible for the attention now given to scholarly communication as a system. The computer caused an unprecedented self-consciousness within the system about scholarly communication as a system.

Whether or not the computer has affected society and scholarship to a greater degree than did the printing press, as we sometimes hear, is an issue that remains for future historians to determine. But there can be no doubt that its influence has been great. The computer and its ancillary technologies have been adopted by all agents participating in the scholarly communication system, from the creator to the disseminator to the consumer. What the computer has made possible is the performance of many functions simultaneously and at great speed, the compacting of vast stores of information into very manage-

able formats, the facile manipulation and modification of that information, and the interconnectibility and correlation of different sets of information. When we think of information as communication, we see why the advent of the computer is such a landmark in the history of scholarly communication: it tightened the system by intensifying the immediacy of the influence of each agent upon the others.

OUTPUTS AND MECHANISMS OF THE SYSTEM

To the extent that the components of a function are influential on each other and the environment is influential on the components or the whole function, that function exhibits the characteristics of a system. The forces summarized in the preceding paragraphs of this paper fostered the dynamism of the evolving scholarly communication system in several ways: they facilitated, encouraged, and accelerated scholarship, and consequently increased scholarly output. Scholars communicated at astonishingly accelerated rates over those of just a few centuries ago. Their views of this activity were determined by their individual purposes and the principles of science. Publishers selected, packaged, and distributed that communication in their *de facto* role of disciplinary gatekeeper, their selections having been influenced both by their understanding of that role and by economic considerations. Libraries consolidated scholarly communication over time to make it available to scholars. Of course, these are grossly oversimplified descriptions of the traditional activities of the primary agents in the system.

The outputs of the scholarly communication system take many forms. They may be published writings, such as books, journal articles, or reports; they may be unpublished writings, such as correspondence, papers, and other memoranda; they may be unrecorded communications in person or via electronic media of many types. Those communications that most often occur outside the arena of the published or broadly distributed are considered to compose the social phenomenon called the invisible college, which is a highly selective subsystem of scholarly communication. All outputs are associated with all disciplines, the patterns of association varying, however, from one discipline to another. In any case, it is important to bear in mind that the relative importance of a given output of scholarly communication is determined through its acceptance or rejection by the recognized peer review authority in each field.

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The connections among the agents in this system, among the agents and the outputs, and among the outputs had been accomplished until fairly recently through the linear flow of individual communications. Over the centuries, and especially since the adoption of the printing press, the scholarly communication system had evolved at an accelerated rate of speed, becoming more and more a tightly interwoven set of systems and subsystems. Their thrust was the result of social needs met by the purposes and principles of science, whose implementation was encouraged and facilitated by innovations that were both institutional and technological. As suggested earlier, the introduction of the computer and related information technologies brought with it such rapid change and, more importantly, such vast potential for further change in the system that it was jarring to all the system's agents. That was the situation of the scholarly communication system around 1980.

Since then, the future of the scholarly communication system has become an issue. For the first time, there are glimmerings of a self-awareness of the system as a system. The agents are becoming concerned with not just their individual activity in a temporal, linear flow, but with their role in a larger, more complex, and rapidly evolving system. It is generally understood that the system has reached a

critical juncture and that it is in transition, although there does not seem to be at this time a well-defined individual goal sequenced in a linear flow for any of the system's agents. But a social system that becomes self-aware will likely determine to control itself as a system, to conduct its various principles, mechanisms, and energies toward a purpose that should be achieved with as little conflict as possible among the goals of its constituent parts. Such a notion suggests that the scholarly communication system could be on the threshold of restructuring itself.

THE SYSTEM IN TRANSITION

The scholarly communication system is in the process of deep and rapid change, moving from a complex function whose system characteristics only recently have begun to be understood to an evolving system whose new direction is unclear. But the various agents in the system now view this set of activities from a new perspective and with concern. They are concerned about the general future health of scholarship, relying as heavily and uniquely as it does on communication. Each agent is concerned about the role each will have later in the evolution of the system, and they are all concerned with the identification of the force that will be most influential in giving direction to the evolution of the system.[8] Following are some of the issues presented by the system in transition.

Intrusion of Economics

Economics forms a vast supersystem that affects all aspects of human activity, one which became very directly and immediately involved in the scholarly communication system, as observed earlier in this paper, with the advent of the printing press. Now, under increasing influence of the computer and associated information technologies, economics is an ever-present, distinct consideration throughout the system. Publication is becoming less of a discrete function in the system, for the high-level technologies have reduced costs of what has become traditional publication to the point at which it can become a pervasive function among all the agents. In a sense, this takes us back to the original meaning of the root *publicare,* to make public. This new capacity to completely integrate or absorb publication is accompanied by greater cost overall to the system, because of the overload of high production, and by heightened intensity of concern about the economic aspects of copyright.

In one way or another, the system in transition is now supporting two modes of operation: the so-called traditional with somewhat discrete roles, functions, and mechanisms; and the technology-intensive mode of operation. The characteristics of the transitional phase of the system may be most readily apparent in librarianship and the publication industry, but they are to be found throughout this system. Consequently, the transitional phase brings with it economic impact of such magnitude and potential that it will almost certainly bring about very major agency and institutional changes within the system. Universities, for example, will surely be forced by the economics of the situation to come to grips explicitly with the priority they assign to scholarly communication.

Circumvention of the System

In the view of some observers of the evolving scholarly communication system, fundamental principles of scholarship and science may be in jeopardy. The ease of publishing, or making public, scientific and scholarly information could lead to circumvention of that part of the system that traditionally has guaranteed the peer review and critical debate that are so essential a part of scholarly communication. Free exchange of ideas among scholars and scientists is an extension of these principles, and it is in that context that current U.S. government restrictions on access to certain categories of information, rendered quite manageable through electronic media, is a circumvention of the system through the provision of only highly selective access. Therefore, it is a violation of fundamental principles of science and scholarship. And even the na-

ture of electronic information, which is highly transient, poses a threat to very important features of scholarship and science. For among those important features are the abilities to track the development of ideas, to track the authority and validation of them, and to accumulate knowledge.

Noise in the System

While circumvention of the scholarly communication system poses potential threat to the future health of scholarship and science, so does communication within system. Communication overload, the piling up of more information than can be used effectively or efficiently (also known as noise), is a phenomenon as old as writing and constitutes one of the primary reasons for the establishment of libraries ages ago. Historically, each time overload threatened to become a problem, means of gaining control over the communication flow were created. Whether or not we have consistently lost ground in the battle against noise in the system in spite of the many innovations designed to cope with it is an interesting question that remains to be debated in our literature. What does not need to be debated is the notion that the scholarly communication system of 1989 is fast becoming a deafening cacophony.

Under the current load, the gatekeeping functions of publishers and learned societies can become overtaxed, weakened, and diminished; the principles of peer review and critical debate may not be invoked with adequate rigor. In this environment, many in the system believe there is a growing confusion of information and knowledge that threatens to lower the general substance of communication. The issue of identifying quality within the vast quantity of communication is well known to all agents in the system. In libraries, the traditional understanding of collections and of collection development must be reconceptualized.

The Interface of Structures

Universities occupy a very large place in the scholarly communication system insofar as they make possible much of the activity generated by a substantial number of the system's agents: scholars, librarians, and publishers. Until now, the structure of the university did not affect in evident ways the scholarly communication system, except to fuel it. As a system, scholarly communication evolves naturally, as it is stimulated, and it is now evolving at an accelerated rate. In contrast, the university controls itself and is conservative, at least in part by design: its structure does not change quickly, for it is intended to be a stable institution that guarantees cultural and social continuity.

In the university structure both the library and the computing center have been maintained as discrete sites with specific sets of local functions. How the library and the computing center should be associated on campus is now an issue in the minds of many observers of higher education. The issue is likely to intensify because it will be emphasized the more the location of the library and the computing center in the structure of the university clashes with their place in the structure of the scholarly communication system.

Whereas the university has not even formally acknowledged that libraries and computers are partners in the business of scholarly communication, the system of scholarly communication has evolved naturally, so that the library provides the system's conceptual framework and structure, while the computer provides the media through which the system operates. Unless the university's structuring of computers and libraries is adjusted to mirror the structuring of the larger scholarly communication system, higher education could unwittingly pose an impediment to the harmonious process of the system that enhances science and scholarship through communication.

THE LIBRARY AS STRUCTURE

In spite of the many great complexities that cloud the social phenomenon we call the scholarly communication system, the fundamentals of that system remain constant. Communication for the purposes of peer review, critical debate, and the ad-

vancement of knowledge is an essential, integral part of science and scholarship. What has changed in recent decades is not that principle, but the volume of communication within the system. It is here that we discover that the library is the protective shield around the structure of a system whose survival depends upon continued implementation of its principles. It has become clear that implementation of these principles is a function of selectivity and that selectivity is the underlying principle of librarianship.

Selectivity is a fundamental characteristic of all functions in the scholarly communication system. Selectivity determines the extent to which the principles of scholarly communication will be implemented; as Vannevar Bush observed nearly a half century ago, "The prime action of use is selection."[9] It is upon system selectivity that the survival of a social system hinges. And selectivity is embedded deeply in the principles of librarianship, where the purpose is to help other agents in the system be selective. Selectivity by the researcher is manifested in the choice of area for investigation, which is determined in part by knowledge of what has been or has yet to be accomplished. Selectivity by the publisher is manifested in the choice of information to be made public, a decision most often directed by either the economic viability or the quality of the information. Selectivity by the receiving scholar is manifested in the choice of information to use, that decision being affected primarily by availability, convenience and, within those parameters, determination of relevance.

In these cases, selectivity is agent centered. In the case of the library, however, selectivity is system centered, for here it is guided by the purpose of controlling inputs into the system for use by other agents. Comprehending this difference between the library and the other principal agents in the scholarly communication system is very significant to understanding the unique role of the library as a protective shield around the structure of the system.

The history of the library and the principles of librarianship is the history of the development of strategies to cope with the economics of and increasing noise in the scholarly communication system, in the interest of ensuring selectivity within, by, and for this system. Inherent in this protective function of the library—making the system work—is the closely related function of monitoring scholarly communication so that adjustments can be made. No other agent in the system has that function. Installed with this purpose, the library has acted and will continue to act in response to stimuli from its environment both within and outside the scholarly communication system, taking initiatives appropriate to the system's survival.

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