Essays of an Information Scientist: Of Nobel Class, Women in Science, Citation Classics and Other Essays, Vol:15, p.398, 1992-93 Current Contents, #49, p.3-12, December 6, 1993

Current Comments®

EUGENE GARFIELD
INSTITUTE FOR SCIENTIFIC INFORMATION®
3501 MARKET ST., PHILADELPHIA, PA 19104

A Tribute to the New York Academy of Sciences: Denis Cullinan on Its History, Future, and Classic Papers

Number 49 December 6, 1993

Introduction

Most people probably know the New York Academy of Sciences through its *Annals* series, which was founded in 1823 and publishes the proceedings of Academy-sponsored conferences. In addition, the Academy publishes *The Sciences*, the popular science magazine which is distinctive both for lively articles and commentaries as well as vividly reproduced art and graphics. In a 1980 *Current Contents*® (*CC*®) essay, I described its origin in 1961 as a monthly pocket-size, *CC*-like listing of the Academy's programs and activities.[1] Today, it is a full-color bimonthly magazine designed to promote science to the general public, including the research community.

My association with the Academy goes back many years. I am a member of the Science Policy Association it sponsors and serve on the Academy's Publications Committee. This long relationship is founded on many shared interests. The Academy has addressed various issues important to the scientific community. While its conferences largely address basic research topics, the Academy has dealt with a variety of issues of broader interest to the scientific community. They include science education, especially at the high school and earlier levels; public appreciation and understanding of research; women and minority participation in science; human rights of scientists; science policy and funding; and so on. Many of these topics have also been discussed in *The Scientist*®, the biweekly newspaper founded in 1986.[2]

One of the oldest scientific societies in the US (founded 1817), the Academy has a long history of leadership in promoting research communication between scientists as well as public understanding of science. In its early years it served primarily as a meeting place for scholars associated with universities, museums, and scientific societies in the Greater New York area. Beginning in the 1940s, it expanded its mission by sponsoring international conferences on various scientific themes, which today number about 18 per year. The Academy now is an internationally renowned society with about 40,000 members and is recognized as an active forum for the discussion and promotion of research.

I first planned to profile the Academy when Heinz Pagels was its executive director. Pagels wrote the foreword to volume 10 of *Essays of an Information Scientist*.[3] But he died tragically in a mountain climbing accident in 1988 before a *CC* essay could be completed. He was succeeded by Oakes Ames, former president of Connecticut College, who served until 1991. In February 1992, the Academy appointed its current Chief Executive Officer, Rodney W. Nichols, who previously was executive vice president of Rockefeller University.[4]

In the following essay, Denis M. Cullinan reviews the Academy's past development, future strategy, and the impact of the *Annals*. He has been serving as consulting editor and writer at the Academy since 1982. Educated at Fordham, Columbia, and New York Universities, he has retired from a 25-year career in secondary school science education as teacher and administrator in New York City. He now devotes himself to scientific editing and writing.

REFERENCES

1. **Garfield E.** *The Sciences*: science journalism written by scientists. *Current Contents®* (48):5-8, 1 December 1980. (Reprinted in: *Essays of an information scientist.* Philadelphia: ISI Press®, 1981. Vol. 4. p. 696-9.)
2. ----------. *The Scientist®* newspaper: seven years on the human and professional sides of science. *Current Contents* (43):3-6, 25 October 1993.
3. **Pagels H R.** Foreword. (Garfield E) *Essays of an information scientist: peer review, refereeing, fraud, and other essays.* Philadelphia: ISI Press, 1989. Vol. 10. p. ix-xi.
4. **Spector B.** New CEO envisions a broader role for New York Academy. *The Scientist* 6(6):3; 9, 16 March 1992.

The New York Academy of Sciences *Annals*: From the Founding Through the Future

by

Denis M. Cullinan

A Cross Section of the Academy

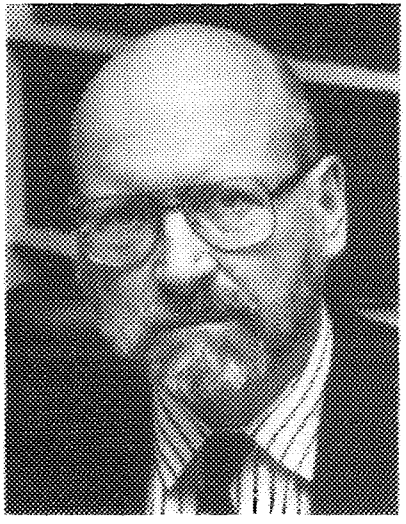
The New York Academy of Sciences, founded in 1817 and one of the oldest scientific societies in America, has grown from a small institution of 150 members to a large, global community of almost 40,000 practicing scientists, engineers, physicians, and interested laypersons in more than 125 countries who participate in a plenitude of scientific activities all designed to promote the cause of science and to help science and technology serve the world. The Academy brings together individuals from government, academia, and industry, acting as host and facilitator for a variety of exchanges on research interests. It also participates in science policy discussion on a national and international level and sponsors the Science Policy Association, at which policy leaders in government, science, and industry can meet informally and productively to discuss such matters of mutual concern as federal funding priorities, the economic competitiveness of the US, environmental regulation, health policy, and defense conversion. Through its Human Rights of Scientists Committee, the Academy helps to monitor human rights violations and to exert pressure on governments to allow scientists their international rights and freedoms. This committee has been credited in helping to aid the release of Andrei Sakharov, Yuri Orlov, and Fang Lizhi.

The Academy lends its help to the vast New York metropolitan educational community through programs intended to mentor and nurture high school students. Through the Science Research Training Program, students participate in laboratory internships, and the Education Department collaborates with the New York City schools to produce the School Science and Technology Expo, at which 1,400 students present projects. The Education Department also sponsors the Junior Academy, a leadership-development program for more than 1,000 high school students who organize their own lectures, field trips, and career guidance programs.

At the Academy's headquarters, a 32-room mansion on East 63rd Street donated in 1949 by the Norman Woolworth family, the Academy affords professional scientists in 25 sections and the public with an ample schedule of lectures and meetings and provides special activities for the community of retired (or nearly so) Academy members through its Lyceum Club.

Academy Conferences and Publications

The Academy has an active conference program, having mounted 23 conferences in the past year on such subjects as plate-



Bill M. Boland, Executive Editor, Annals of the New York Academy of Sciences

Rodney W. Nichols, Chief Executive Officer, New York Academy of Sciences

lets and vascular occlusion, microbial pathogenesis and the immune response, and human gene therapy. A particularly successful convocation was held two months ago to celebrate the fortieth anniversary of the publication of the structure of DNA, attended by 900 persons who came to hear 10 Nobel Prize winners, including James Watson, whose work was so important to this discovery. The Academy's publishing program features the *Annals* and a much-decorated science magazine, *The Sciences*, a bimonthly magazine that combines four-color fine art reproductions with lively essays of general scientific interest.

Each year the Academy publishes between 30 and 36 *Annals*, which are book-length reviews of a subject, combining both original research and review articles from researchers working in a variety of disciplines. The *Annals* serve as a baseline source of information for years to come and generally also contain transcribed discussions of the papers and overviews of the subject that attempt to place the individual studies within a wider context, thus increasing their accessibility to graduate students.

In a world of increasing scientific fragmentation, the Academy conferences and the *Annals* fill a niche identified by Amiram Landman and C.L.B. Lavalle, who foresaw that the "Darwinian" elimination of numerous peripheral and specialized journals would increase "the number of those [publishing] reviews and articles of an interdisciplinary nature, through which ideas would be fertilized by exchange and discussion."[1] The *Annals* are distributed free and deeply discounted to members, and they are also sent to a subscription base of 743 major biomedical and technological research libraries worldwide.

With these activities, and with a renewed focus on the goal of advising and mediating on issues of crucial import to public policy, the Academy, originally little more than a naturalist's discussion club, has come a long way since its origins.

The Institution: Early Days

The membership, activities, organization, resources, location, and even the name of the New York Academy of Sciences have

undergone sometimes radical changes in the 176 years of its continuous existence. But its mission to propagate scientific and technological knowledge through the publication of its *Annals* has continued to be a perennial concern since their first appearance in the early decades of the last century.

Originally called "the Lyceum of Natural History in the City of New York" (and given its present name in 1876 during the nation's centennial celebrations), the institution was founded in 1817 by the polymath physician, legislator, and educator Samuel L. Mitchill (1754-1831), whose contemporaries Thomas Jefferson and James Monroe were honorary members. It furnished an early focus for scientific preoccupations in the New York City region, enlarging Dr. Mitchill's tradition of "occasional meetings in one of the lecture rooms" at the College of Physicians and Surgeons in that city. The meetings have never ceased, but across the years the Academy was to endure painful vicissitudes. In 1843, the loss of its headquarters building to creditors, a repercussion of the Panic of 1837, made it dependent upon the largesse of other institutions for its accommodations for well over a century. It lost its museum collection to a catastrophic fire, forever forfeiting its stake in the movement to establish a preeminent museum of natural history in New York City. At one point (after the debacle of 1843), it came perilously close to dissolving altogether.

As profound transformations took place in the surrounding culture, the character of the Academy shifted considerably, too. It persevered—intermittently, on a varying scale, and as long as it could—as a museum of natural history. Touchingly, John Howard Redfield, the first president of the American Association for the Advancement of Science, would recall childhood memories of gazing at the specimens of the "cabinet," or collection, of the Lyceum. Then, tragically, the conflagration that wiped out a city block of buildings on 14th Street in 1866 carried off its store of specimens, the irreplaceable work of a half century of collection and taxonomy by the country's leading naturalists. For the space of a century, its steadily growing library, only 600 volumes in 1826 but amounting at its largest to 26,000, represented a significant research resource in the city. But investigators interested in the natural-historical literature represented by the Academy's library would have to betake themselves to the American Museum of Natural History after 1926, when it was donated to that institution. The Academy was to wait until 1907, when it acquired discretionary powers over the funding resources of the Scientific Alliance, a short-lived but well-heeled association of specialist societies, before it began to assume a serious sponsorship role towards natural-historical research for the first time.

This change in the direction of its activities culminated in an extensive, ongoing scientific survey of Puerto Rico (1919-mid-1940s). Aside from this venture, a most substantial one, and two minuscule and unsuccessful expeditions in Pennsylvania and New York State in search of mammoth remains early in the last century, the Academy has not directly sponsored scientific fieldwork as such. And so Dr. Mitchill's "occasional meetings in one of the lecture rooms" that led to the founding of the Lyceum, and the purpose he expressed that its members should "explore and expound the arcana of nature" in emulation of the archetypical Lyceum founded by Aristotle, were to typify the Academy's lasting character as a forum for scientific dialogue and a platform from which scientific knowledge was to be disseminated.

Origin of the *Annals*

Lectures and discussions were a constant feature of the institution from its founding. Within a year these were being published in synoptic form in a contemporary jour-

nal, the *American Monthly Magazine and Critical Review*, until the *Annals* came to be first published in 1823. This journal, too, at one point devoted a few of its pages to an extract from the report[2] delivered at a Lyceum "sitting" in June 1817 in which Dr. Mitchill and a confederate described their venture in mammoth-hunting in Chester, New York. More romantically than scientifically, they had written, "the length of the tusk was nine feet, or upwards, of *solid ivory*"—their emphasis—in a passage that would not be out of place in *King Solomon's Mines*. (A later analysis showed the "ivory" to have been common calcium carbonate.)

The production of a scientific journal in these times was a chancy undertaking, depending for success on a vanishingly small base of subscribers who were both interested in the sciences and able to meet their subscription payments. After a vigorous start in 1810, the first attempt to launch a scientific periodical in the US, Archibald Bruce's *American Mineralogical Journal*, failed after less than four years' publication, a victim of debt and Bruce's failing health and growing disillusionment.

With some reluctance, Benjamin Silliman, professor of chemistry at Yale College, undertook to step into the breach in 1817 with the founding of the *American Journal of Science and Arts*. The first number was a sellout—one thousand copies were speedily disposed of, with plans for a reprint. But while Silliman enjoyed the expected *embarras de richesses* in acquiring manuscripts from contributors, by the time the fifth number (which never appeared in print) was ready for publication in 1819, the printer was dunning him for the discouragingly large sum of $2,500 and feelings were running high. Subscribers were defaulting at a devastating rate of 66 $^{2}/_{3}$ percent, and Silliman was not above sending one of his closest and most influential friends a stiffly worded reminder to pay in advance. While his *Journal* survived, Silliman had, however, generously offered space in its pages to the Lyceum for summary accounts of its proceedings.

The *Annals* were able to escape untimely ruin through the efforts of the naturalist John Torrey, a close associate of the Lyceum who was appointed its president in 1824, one year after the first issue appeared. But only just. The subscription base for the *Annals* was about 150 (versus Silliman's 400), and only by Torrey's struggles to shore up the Lyceum's shaky financial foundations—and to reduce the rate of delinquent subscribers—were the *Annals* able to maintain a precarious grasp on existence.

New York Governor DeWitt Clinton, a Lyceum member, seems not to have been so preoccupied by the building of the Erie Canal (1817-1825) that he was constrained to neglect his role as naturalist: no less than two articles appeared over his name in the first volume of the *Annals*.[3,4] The shorter of these, a "Description of a New Species of Fish from the Hudson River," prefigures the modern scientific paper in its stripped-down, impersonal statements of fact. A longer paper, setting forth the ornithology of swallows, groans under the dead hand of Anglo-Saxon Renaissance style—Clinton felt obliged to preface his article with a fanfare of allusions to classical authors, quoting Horace, Hesiod, and Virgil, and retailing the opinions of Herodotus, Aristotle, and Pliny before getting down to scientific brass tacks. By way of supplementing Clinton's somewhat unoriginal review with some freshly gathered data, John J. Audubon, himself a member of the Lyceum, contributed a lucid and lively firsthand account of his field researches into the swallow question.

Although natural history was to remain the bread and butter of the *Annals* until recent times, occasional papers relating to "harder" sciences such as chemistry, medicine, and astronomy would find their way into these volumes. As early as 1874, the

Lyceum was publishing a paper like "Outlines of a Bibliography of the History of Chemistry."[5] (Although alchemy is more than fairly represented here, it is interesting to note the author's bluff dismissal of its value, with no concessions to anything like the current vogue for historical relativism, as an "aberration of the human intellect," and "an art that is no art; its first principle is the lie, its methods are laborious, and its result is beggary."[6])

The last volume of the *Annals* published before the Lyceum assumed its present name as the "Academy of Sciences"—thus acknowledging the rearrangements in "natural philosophy" that were already giving rise to scientific specialties resembling modern ones—contains a paper that strikes a remarkably contemporary note.[7] It deals with environmental pollution, rather quaintly termed "filth among men." The author condemns the pollution attributable to "ignorance...cupidity...[and the] many maladjustments of our existent social systems," calls for "moral zeal" to restore "the same pure air, pure water, and fitting food...as are enjoyed by the beast which stalks through the primeval forest," and approves the unanimous consensus of science that Nature knows best, in the sense that "the natural order existent in the atmosphere, water, and food [is] the best adapted to the wants of man," and that "every disturbance is to be looked upon with suspicion." Making suitable allowances for the antique flavor of some of this terminology, we have here most of the staple concepts that inform the perfervid prophecies of our own ultramodern, quasi-religious ecology movement.

The *Annals* in Our Times

Until the end of the 1930s, the Puerto Rico survey represented the major activity of the Academy. But under the leadership of the dynamic Eunice Thomas Miner, who joined the Academy in 1935 and was appointed executive secretary four years later, the scientific conferences that focus on special themes and that form such an important part of the Academy's present mission began to make their influence felt across a broader front than geology and natural history had hitherto commanded. In 1938, a two-day conference on electrophoresis was convened, its proceedings being published later by the Academy, an event foreshadowing later developments that were to eventuate in achievements virtually unparalleled in the history of the dissemination of scientific information through the medium of the printed page.

Already the sales of the *Annals* for 1939 had increased by a factor of four, and 1941 was a record year for Academy publications. With the donation to the Academy of the Woolworth mansion on East 63rd Street, it had by 1950 found headquarters of its own for the first time in generations. Before this stroke of generosity, the Academy had had to make do with a few rooms loaned to it by the American Museum of Natural History. And the conference space now available to it would make it possible to plan for heavy schedules of scientific gatherings, drawing specialists from the national and international domains. At this point, the *Annals* assumed their present form as the Academy, through these conferences, strove to provide a synoptic view of a given subject by inviting speakers whose assembled viewpoints would make it possible for workers in a field to enjoy an enhanced scope of vision that would cut across otherwise needlessly limiting compartmental boundaries.

The *Annals* share some of the character of a specialist journal, offering a spectrum of papers on a particular theme; each "issue," however, is a substantial, compendious volume, the kind of thing that can, and does, weigh down a library bookshelf. As of this year, in fact, 743 libraries subscribe to the full *Annals* series, and Academy staff have in their travels been gratified to be-

Table 1: Citation-frequency distribution for the 565 articles of the *Annals of the New York Academy of Sciences* with 100 or more citations listed in the 1945-1992 *SCI*®.

Citation Level	Number of Articles at Level	Percent of Total Items
>10,000	2	0.4
1000-10,000	1	0.2
900-999	1	0.2
800-899	1	0.2
700-799	6	1.1
600-699	4	0.7
500-599	5	0.9
400-499	10	1.8
300-399	22	3.9
200-299	74	13.1
100-199	439	77.7

Table 2: Chronological distribution of publication dates for the 565 articles of the *Annals of the New York Academy of Sciences* with 100 or more citations listed in the 1945-1992 *SCI*®.

Year of Publication	Number of Papers
1985-1989	6
1980-1984	23
1975-1979	78
1970-1974	86
1965-1969	98
1960-1964	118
1955-1959	101
1950-1954	31
1945-1949	18
1940-1944	6

hold long ranks of *Annals* presenting their shopworn spines to many a library's visitors: shopworn, because well thumbed—these volumes are in heavy demand by students and professionals alike. Indeed, the *Annals* have contained some of the most highly cited articles in history.

The Citation Record

For both scientific and administrative purposes, publishers have sought a measure of the effectiveness of a publication in disseminating information. Just a few decades ago, estimates of this "effectiveness" were made on the basis of the frequency of requests for reprints of papers. But with the advent of office photocopying technology and the do-it-yourself reprints it makes possible, a newer means of making this sort of assessment, the citation frequency of a paper—the number of times reference to the paper is made in the relevant literature—has been made available. The Institute for Scientific Information® (ISI®) maintains a database, the *Science Citation Index*® (*SCI*®), that includes complete bibliographic information on 15 million papers published in thousands of journals from 1945 to date as well as the 215 million references they cited.

The performance of the *Annals* as assessed in terms of their citation record is of considerable interest. Of the 4,500 scientific publications included in the 1992 *SCI Journal Citation Reports*®, the *Annals* is ranked 80th by total citations received in that year. With respect to the 32,700,000 cited items in the 1945-1988 *SCI* database, the *Annals* have 565 articles cited 100 or more times, which rank in the 99.5th percentile in terms of citation frequency.

The *SCI impact factor* is an indicator of a journal's impact on research. For a given year, this value is the average number of citations made to articles published in the two preceding years. For the *Annals* in 1992, this value is 0.83; the *Annals* on this showing rank 15th out of the 60 journals categorized as "multidisciplinary" in the *SCI*.

Another measure of a journal's effectiveness is its *half-life*, the age of the journal's articles, counting back from the current year, at which point it received 50 percent of total citations in a given year. For 1992, the half-life value for *Annals* articles was 7.8 years. For the 1992 *SCI* database, the half-life of a typical journal was 6.9 years. The indication is that the *Annals* have a "shelf life" comparable to that of the average primary research journal.

The Most Highly Cited Papers

The citation record for *Annals* articles is so out of the common track that in what

Table 3: Four most highly articles from the *Annals of the New York Academy of Sciences*, 1945-1992 *SCI®*.

Cites	
19,498	1. Baruch J. Davis. Disc electrophoresis—II. Method and application to human serum proteins. Vol. 121, pp.404-427, 1964.
17,891	2. George Scatchard. The attractions of proteins for small molecules and ions. Vol. 51, pp. 660-672. 1949.
4,650	3. Leonard Ornstein. Disc electrophoresis—I. Background and theory. Vol. 121, pp. 321-349. 1964.
922	4. Lars Onsager. The effects of shape on the interaction of colloidal particles. Vol. 51, pp. 627-659. 1949.

follows I will restrict my observations to papers with 100 or more citations listed in the 1945-1992 *SCI* database. (When I refer to a "highly cited article," it will be to a paper of just this description.) Table 1 shows the citation-frequency distribution for the 565 highly cited *Annals* articles in the *SCI®* record. Table 2 gives the chronological distribution of publication dates for these articles. The four most highly cited articles by themselves account for a total of almost 43,000 citations and are shown in Table 3.

It will be apparent that two Academy conferences have been responsible for these four articles. Articles (2) and (4) were the result of a conference entitled *Molecular Interaction*, held in 1948; articles (1) and (3) arose out of a conference, *Gel Electrophoresis*, convoked in 1963.

The work of Davis and Ornstein as reflected in these papers is seminal in the development of protein analysis by gel electrophoresis. Aside from its enormous value as a versatile analytical tool, gel electrophoresis can be applied to the isolation and preparation of biochemically interesting species. A development that was part and parcel of the techniques being investigated in the early 1960s was SDS gel electrophoresis, applicable to the determination of molecular size; and the combination of electrophoretic methods with binding methods, which has found use in the sequencing of proteins and the cloning of genes, has carried this technology into a most advanced realm.

Onsager helped move towards realization of the dream of rationalizing solution behavior that was conceived in the Debye-Hückel theory: he achieved a tour de force of mathematical modeling, characterizing molecules geometrically in the abstract; happily, the observable behavioral properties of DNA and liquid crystals have since borne out his calculations. Scatchard worked out the mathematical basis for determining the two binding constants—the number of binding sites on a protein and the affinity of small molecules for it—that form, for one example, the foundation of our understanding of the binding of neurotransmitters to their receptors.

The Conferences That Produced Multiple Highly Cited Articles

The *Annals* format, in which current review and research articles are brought together in a single volume, would seem to have the virtue of advertising, so to speak, the assembled conference papers, a re-

Table 4: Distribution of New York Academy of Sciences Conferences yielding one or more articles cited 100 or more times in the 1945-1992 *SCI®*.

Number of Papers Cited 100 Times or More	Number of Conferences
10	2
9	1
8	2
7	4
6	6
5	14
4	14
3	32
2	54
1	134

Table 5: Academy conferences that produced the greatest number of highly cited papers, 1945-1992 *SCI*®.

1. *Prostaglandins*, 1970. Resulting papers published in *Annals*, Vol. 180, 1971. [10 highly cited articles]
2. *New Adrenergic Blocking Drugs: Their Pharmacological, Biochemical, and Clinical Reactions*, 1966. Vol. 139, 1967. [10 highly cited articles]
3. *Calcium Transport and Cell Function*, 1977. Vol. 307, 1978. [9 highly cited articles]
4. *Gel Electrophoresis*, 1963. Vol. 121, 1964. [8 highly cited articles]
5. *Research in Demyelinating Diseases*, 1963. Vol. 121, 1964. [8 highly cited articles]

searcher consulting a given paper having the related papers immediately to hand. One would thus expect the conference format to have the effect of yielding multiple extensively cited papers per conference. Table 4 shows that 49 percent of Academy conferences resulting in any highly cited articles at all, have resulted in two or more; 11 percent have yielded five or more. Prima facie, and in absolute terms, these data seem to confirm the presence of a "ganging-up" effect on the part of the conference-annals format.

By the criterion of "superpaper" yield (≥ 100 citations), the five most productive Academy conferences are those shown in Table 5. The themes examined by these conferences tellingly represented then-current scientific interests and were to remain powerfully influential in later years, by the "superpaper" standard. Of gel electrophoresis we have already seen the importance: Under this rubric, the Academy conference pioneered the growth of interest in the then-new field of protein separation. Research into adrenergic blockade was part of the contemporaneous explosion of interest in the nature of chemical transmission in biological systems. The need to classify the chemical receptors mediating such transmission from cell to cell supplied the impetus to work with adrenergic receptors, and out of this context there grew in time the methods that made possible the cloning of these receptors, particularly of the G-proteins that are bound to receptors and released at need in order to activate other functional proteins within the cell. Prostaglandins, similarly, are messenger species; these operate locally, at the level of tissue organization, and are involved in uterine contraction and blood-vessel constriction, whereas calcium is able to play its messenger role within the cell itself. In these early times when the Academy conference on calcium transport was held, its role in metabolic pathways was being examined, as well as its action at the mitochondrial membrane and at nerve terminals.

The isolation and purification of myelin, the fatty matter forming the sheath of the neuron's axon, was one of the earliest achievements of contemporary neurochemistry. The investigation of such complaints as multiple sclerosis, which involves pathological changes in the myelin sheath, was to build upon such early developments by bringing together such disciplines as neurobiology, immunology, and virology.

Current Concerns and Future Prospects

The conferences sponsored by the Academy itself have in recent decades focused predominantly on biomedical issues, most Academy members being in fact involved professionally in this area. In the 1970s, however, under the direction of Bill Boland, executive editor of the *Annals*, the Academy began to review proposals for non-Academy conferences, and by the early 1980s, publication of their proceedings was becoming the goal of systematic and regular efforts, with the result that the physical and social sciences have come to be represented in such titles as *Galactic Models*, *Relativistic Astrophysics and Particle Cosmology*, *Towards a Transnational Perspective in Migration*, *The Uses of Linguistics*, and *Windows on the Brain*, to mention just a few. Non-Academy conferences now account for up to one-half of the *Annals*'

yearly output. With the publication of *Annals*, both Academy-sponsored and otherwise, on drug abuse, earthquake hazards, hospital computer networks, public infrastructure, and language and gender, among others, Hans Bethe was able to say of the Academy that "[i]ts most important activity...is the publication of reports of conferences on the impact of science on society."

Indeed, in these last days of the twentieth century, it is toward the question of the interface of science and society that the Academy, under the direction of its CEO, Rodney Nichols, now turns its critical attention. And, while the Academy will continue to hew to its mission of providing multidisciplinary forums that "integrate the perspectives of increasingly narrow specialties,"[8] it accepts the responsibility to enact this communication within the context of the information explosion that has resulted from technologies that can be expected by the turn of the century to—in principle at least—make all scientific information available to most players in the global STM community.

But the magnitude of this electronically transmitted information (accessing it has been described from the recipients' point of view as "trying to take a drink of water from a fire hose") imposes a myriad of problems including legalities of copyright, an often perplexing abundance of changing software and hardware options available to end-users, and, most important, the professional validation of the scientific information thus transmitted. It is here that the *Annals*, drawing upon its demonstrated strengths, hopes to continue to provide summative volumes that will allow informationally overburdened researchers to have a compilation of the best information available in their field.

Acknowledgements

Dr. Simon Baatz's thoughtful and balanced history[9] of the Academy furnished me with a good deal of my historical understanding of its affairs and the part the *Annals* played in them. I am furthermore indebted to the advice and encouragement of Rodney Nichols, Bill Boland, and Ann Collins Walsh (the New York Academy of Sciences), Dr. Philip Siekevitz (Rockefeller University), Dr. Neville Kallenbach and Dr. Charles Nicholson (New York University), Dr. David Gadsby (New York Medical College), Dr. Eli Michaelis (University of Kansas), Dr. Bruno Zimm (University of California, San Diego), and Dr. Eugene Garfield (ISI®).

REFERENCES AND NOTES

1. Landman, A.D. and Lavalle C.L.B. Updating scientific publication. *Trends in Biochemical Sciences*. Vol. 1. Quoted in Dixon, B. 1988. Science and the information society. *Scholarly Publishing*. Vol 20 (1), p. 12, 1976.
2. *The American Monthly Magazine and Critical Review*. Vol. I, pp. 195, 196. New York, July 1817. Reprinted in *Annals of the New York Academy of Sciences*. Vol. XVIII, pp. v, vi. 1908.
3. DeWitt Clinton. Description of a new species of fish from the Hudson River. *Annals of the Lyceum of Natural History of New York*. Vol. I. Part the First, pp. 49, 50. 1824.
4. ----------. On the *Hirundo fulva* of Veillot, with some general remarks on the birds of this genus. *Ibid.*, pp. 156-166.
5. H. Carrington Bolton. Outlines of a bibliography of the history of chemistry. *Annals of the Lyceum of Natural History of New York*. Vol. X, pp. 352 et seq. 1874.
6. *Ibid.*, p. 353. The latter quotation is my translation of the author's Latin.
7. Albert R. Leeds. Recent progress in sanitary science. *Annals of the Lyceum of Natural History of New York*. Vol. XI, pp. 266-288. 1876.
8. Plans for the New York Academy of Sciences in the 1990s. Revised draft for discussion. October 22, 1993.
9. Simon Baatz. *Knowledge, Culture, and Science in the Metropolis: The New York Academy of Sciences 1817-1970. Annals of the New York Academy of Sciences*. Vol. 584. 1990.