

Reviewing Review Literature. Part 2. The Place of Reviews in the Scientific Literature

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In the first part of this essay I discussed the wide range of styles and approaches to be found in review literature.¹ In continuing the discussion of reviews, one paramount problem that must be addressed involves the ways in which reviews are covered by ISI® and other services, which in turn brings up the problem of the size of the literature.

ISI's *Index to Scientific Reviews™* (*ISR™*) provides one measure of the size of the review literature. In 1986 we indexed approximately 32,000 review articles. There were 224 review publications covered in the 1986 *ISR*. And these do not include the thousands of book chapters in composite works that are essentially review articles covered by our *Index to Scientific Book Contents™*.²

By examining ISI's *Science Citation Index®* (*SCI®*), we can get some idea of the ratio of review articles to total items in the index. Of the 625,432 articles indexed in the 1986 *SCI*, for example, approximately 30,000, or about 5 percent, are review articles.

Statistics from other abstracting and indexing services provide further measurements of the size of the review literature. Of the approximately 385,000 articles abstracted yearly by *Chemical Abstracts*, for example, approximately 40,000 are review articles, about 10 percent. And of the 244,000 articles published in 1986 indexed by the National Library of Medicine, Washington, DC, about 9,300 were review articles, about 4 percent.

In order to find or review the literature on any subject, one may start with an index like the *SCI* or by using an abstracting service. Generally, if the field is large enough and the subject has been reviewed, the *SCI* or the abstracts would contain the relevant material on the subject. Since researchers and librarians rely so heavily on reviews in searching the literature, derivatives such as the *ISR* have been created. The *ISR* is a multidisciplinary index designed specifically for locating review articles.

A new service, the *ISI Atlas of Science®*, provides a unique source of reviews. It is also an invaluable tool for the writer of reviews. The *Atlas*, as I've noted, combines our objective, computerized methods for identifying research fronts with the subjective, expert views of authorities in the field. Recently we announced the inaugural volume in the series, the *ISI Atlas of Science: Pharmacology*, the first of the 12 discipline-related sections containing a collection of current surveys on active research areas.³ The written surveys provided by the experts serve, in effect, as what might be called condensed reviews—summarizing current work and future applications as well as highlighting the key players in the field. What sets the *Atlas* apart from other publications is the systematic manner—using the research fronts developed from our database—in which subject areas are identified for review. This systematic approach eliminates the need to rely solely on an editorial board, whose members might bias the topics covered. This touches on another significant

aspect of review literature: reviews are generally commissioned by editors. Unlike scientists who submit papers for publication, authors of reviews are sought out by editors and invited to write on a given subject field.

In the first part of this essay I mentioned that while not all reviews are highly cited, the relatively high impact of review journals is well known. A ranking of journals by impact factor in the 1985 *Journal Citation Reports*[®] (*JCR*[®]) demonstrates that 30 of the top 50 journals are review serials. These journals are listed in Table 1. For example, the *Annual Review of Biochemistry*, which published 901 articles between 1955 and 1985, ranks first in terms of impact factor. As the table also indicates, 459 of its articles have been cited over 49 times. *Microbiological Reviews*, which until 1977 was called *Bacteriological Reviews*, published 682 articles between 1955 and 1985. It ranked second by impact, and 358 of its papers were cited over 49 times. *Electroanalytical Chemistry*, which ranked third by impact and published 43 articles between 1966 and 1985, had 18 such articles. *Physiological Reviews* is 10th by impact but produced 590 articles cited over 49 times in the *SCI*. This journal published 658 articles between 1955 and 1985. Of all the review journals covered in the *ISR*, *Physiological Reviews* has the largest number of articles cited 49 or more times.

Table 2 provides a selected list of review journals, listed by publisher. To obtain the list we went through the *ISR* and selected all publishers who produce more than one of the fully covered review journals therein. Omitted for reasons of space are the 27 publishers who produce single journals that are covered in the *ISR*.

Included in the list are publications from Annual Reviews Inc., Palo Alto, California. The *Annual Review of Biochemistry* was the first in the Annual Reviews series. As I mentioned in the first part of this essay, Annual Reviews was founded by James Murray Luck in 1932. He conceived the idea for a

review series on biochemistry during his early teaching days at Stanford. Following its successful introduction, the series expanded. Today, Annual Reviews Inc. publishes 27 different volumes covering such diverse topics as genetics, nutrition, materials science, and psychology (22 of these volumes are covered in the *ISR* and are listed in Table 2). In November 1986 the organization introduced the most recent volume, the *Annual Review of Computer Science*. Other organizations on the list, including Academic Press Inc., Pergamon Press Inc., and CRC Press Inc.—publishers of the "CRC Critical Reviews" series—also produce numerous review serials.

Although I have been concentrating on review journals, it is pertinent to ask what portion of the review literature appears in nonreview journals. Evidence from the *ISR* suggests that review journals account for only a small portion of the review literature. Only 19 percent of the review articles in the 1986 *ISR*, for example, appeared in review journals. The remaining 81 percent appeared in nonreview journals.

Of course, the distinction between review journals and nonreview journals can be vague. For example, *Reviews of Modern Physics*, despite its title, is not solely a review journal. It publishes original research in addition to reviews. Similarly, another journal, *BioEssays*, is not strictly a review journal, but a large part of each issue is devoted to reviews. This also applies to the "Trends" journals published by Elsevier.

A related point involves the comparative merits of reviewing subject areas on a regular basis (e.g., annually) versus reviewing only when the evolution of a subject area makes the effort useful and timely. As Bernard Dixon, European editor of the *The Scientist*[™], points out, both the regular and the *ad hoc* approaches have their uses as well as their drawbacks. In the case of regular reviews, one drawback is that in some instances reviews get written whether or not there are any useful summations or synthe-

Table 1: The top 30 high-impact review publications from the 1985 *SCF*[®] *JCR*[®], listed in alphabetic order.

Journal Title	First Year of Publication	1985 Impact Factor	Rank in 1985 JCR by Impact	Number of Source Items in 1985	Number of Articles Cited over 49 Times, 1955-1985
Accounts of Chemical Research	1968	7.7	43	54	424
Advances in Atomic and Molecular Physics	1965	7.8	41	15	32
Advances in Botanical Research	1963	8.0	38	4	11
Advances in Carbohydrate Chemistry and Biochemistry	1945	9.6	29	4	115
Advances in Catalysis	1948	7.8	40	5	94
Advances in Genetics	1947	7.5	44	5	57
Advances in Human Genetics	1970	7.0	49	5	14
Advances in Immunology	1961	11.6	16	6	158
Advances in Physics	1952	10.3	23	9	172
Annual Review of Astronomy and Astrophysics	1963	9.8	26	12	141
Annual Review of Biochemistry	1932	39.7	1	36	459
Annual Review of Genetics	1967	10.0	25	19	115
Annual Review of Immunology	1983	22.0	4	21	9
Annual Review of Neuroscience	1978	14.8	11	18	37
Annual Review of Pharmacology and Toxicology	1961	9.6	28	29	153
Annual Review of Physical Chemistry	1950	7.1	48	20	115
Annual Review of Physiology	1939	8.0	39	45	157
Annual Review of Plant Physiology	1950	11.1	18	20	342
CRC Critical Reviews in Biochemistry	1971	8.0	36	14	36
Electroanalytical Chemistry	1966	25.3	3	0*	18
Immunological Reviews	1969	10.9	19	44	292
Microbiological Reviews	1937	28.8	2	20	358
Pharmacological Reviews	1951	20.6	6	7	318
Physiological Reviews	1921	15.4	10	18	590
Progress in Inorganic Chemistry	1959	10.4	21	8	74
Progress in Nuclear Magnetic Resonance Spectroscopy	1966	12.4	14	8	27
Progress in Physical Organic Chemistry	1963	13.3	12	4	44
Progress in Psychobiology and Physiological Psychology	1966	7.8	42	4	2
Recent Progress in Hormone Research	1947	6.9	50	15	292
Reviews of Physiology, Biochemistry and Pharmacology	1974	9.8	27	3	26

*No volumes were published in 1985.

ses to be made, resulting in an excess of gratuitous material. On the other hand, reviews that are published sporadically may appear in somewhat unpredictable places (i.e., non-review journals and books) and may be more difficult to track down.⁴ As mentioned earlier, the *Atlas of Science* blends the best of

both worlds, combining systematic surveillance with expert insight and the timely identification of active areas of research and emerging frontiers.

In a recent study published in *Annals of Internal Medicine*, Cynthia D. Mulrow, Department of Medicine, University of Texas

Table 2: Selected list of review publications indexed in the *ISR*[™], arranged by publisher.

Academic Press Inc. Advances in Agronomy Advances in Applied Mathematics Advances in Applied Mechanics Advances in Applied Microbiology Advances in Atomic and Molecular Physics Advances in Behavioral Pharmacology Advances in Botanical Research Advances in Cancer Research Advances in Carbohydrate Chemistry and Biochemistry Advances in Catalysis Advances in Clinical Chemistry Advances in Ecological Research Advances in Electronics and Electron Physics Advances in Genetics Advances in Heterocyclic Chemistry Advances in Immunology Advances in Inorganic Chemistry and Radiochemistry Advances in Insect Physiology Advances in Lipid Research Advances in Liquid Crystals Advances in Magnetic Resonance Advances in Marine Biology Advances in Mathematics Advances in Microbial Physiology Advances in Organometallic Chemistry Advances in Parasitology Advances in Pharmacology and Chemotherapy Advances in Physical Organic Chemistry Advances in Protein Chemistry Advances in Quantum Chemistry Advances in Radiation Biology Advances in the Study of Behavior Advances in Veterinary Science & Comparative Medicine Advances in Virus Research Annual Reports in Medicinal Chemistry Biochemical Actions of Hormones Cancer Treatment Reviews Cell Nucleus Current Topics in Bioenergetics Current Topics in Cellular Regulation Current Topics in Developmental Biology Current Topics in Membranes and Transport Essays in Biochemistry Excited States Fish Physiology Harvey Lectures International Review of Connective Tissue Research International Review of Cytology International Review of Experimental Pathology International Review of Neurobiology Methods in Cancer Research Methods in Cell Biology Methods in Enzymology Methods in Microbiology Physical Acoustics Progress in Nucleic Acid Research and Molecular Biology Progress in Psychobiology and Physiological Psychology	Recent Progress in Hormone Research Solid State Physics—Advances in Research and Applications Vitamins and Hormones—Advances in Research and Applications Akademiya Nauk SSSR Uspekhi Fizicheskikh Nauk/Progress in the Physical Sciences Uspekhi Khimii/Progress in Chemistry American Chemical Society Accounts of Chemical Research ACS Symposium Series Advances in Chemistry Series Chemical Reviews Annual Reviews Inc. Annual Review of Astronomy and Astrophysics Annual Review of Biochemistry Annual Review of Biophysics and Bioengineering Annual Review of Earth and Planetary Sciences Annual Review of Ecology and Systematics Annual Review of Energy Annual Review of Entomology Annual Review of Fluid Mechanics Annual Review of Genetics Annual Review of Immunology Annual Review of Materials Science Annual Review of Medicine Annual Review of Microbiology Annual Review of Neuroscience Annual Review of Nuclear and Particle Science Annual Review of Nutrition Annual Review of Pharmacology and Toxicology Annual Review of Physical Chemistry Annual Review of Physiology Annual Review of Phytopathology Annual Review of Plant Physiology Annual Review of Psychology CRC Press Inc. CRC Critical Reviews in Analytical Chemistry CRC Critical Reviews in Biochemistry CRC Critical Reviews in Biomedical Engineering CRC Critical Reviews in Biotechnology CRC Critical Reviews in Clinical Laboratory Sciences CRC Critical Reviews in Diagnostic Imaging CRC Critical Reviews in Environmental Control CRC Critical Reviews in Food Science and Nutrition CRC Critical Reviews in Immunology CRC Critical Reviews in Microbiology CRC Critical Reviews in Oncology/Hematology CRC Critical Reviews in Plant Sciences CRC Critical Reviews in Solid State and Materials Sciences CRC Critical Reviews in Toxicology Marcel Dekker Inc. Advances in Chromatography Applied Spectroscopy Reviews Catalysis Reviews—Science and Engineering Chemistry and Physics of Carbons Drug Metabolism Reviews Electroanalytical Chemistry Journal of Environmental Science and Health. Part C—Environmental Carcinogenesis Reviews Journal of Macromolecular Science—Reviews in Macromolecular Chemistry and Physics Metal Ions in Biological Systems
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Elsevier Science Publishing Co. Inc.
 Advances in Colloid and Interface Science
 Advances in Inorganic Biochemistry
 Cell Surface Reviews
 Comprehensive Biochemistry
 Coordination Chemistry Reviews
 Progress in Brain Research
 Progress in Medicinal Chemistry
 Reviews in Biochemical Toxicology
 Reviews of Chemical Intermediates
 Gustav Fischer Verlag
 Fortschritte der Zoologie
 Progress in Histochemistry and Cytochemistry
 Veröffentlichungen aus der Pathologie—Progress
 in Pathology
 Grune & Stratton Inc.
 Progress in Cardiovascular Diseases
 Progress in Hematology
 Progress in Hemostasis and Thrombosis
 Progress in Liver Diseases
 Seminars in Perinatology
 S. Karger AG
 Advances in Microcirculation
 Progress in Allergy
 Progress in Biochemical Pharmacology
 Progress in Clinical Neurophysiology
 Progress in Experimental Tumor Research
 Progress in Medical Virology
 Progress in Surgery
 North-Holland Publishing Co.
 Computer Physics Reports
 Physics Reports—Review Section of Physics
 Letters
 Progress in Optics
 Pergamon Press Inc.
 Advances in Enzyme Regulation
 Ion-Selective Electrode Reviews
 Molecular Aspects of Medicine
 Pharmacology & Therapeutics
 Physics and Chemistry of the Earth
 Progress in Analytical Atomic Spectroscopy
 Progress in Biophysics and Molecular Biology
 Progress in Crystal Growth and Characterization
 Progress in Energy and Combustion Science
 Progress in Food and Nutrition Science
 Progress in Lipid Research
 Progress in Materials Science
 Progress in Neuro-Psychopharmacology &
 Biological Psychiatry
 Progress in Neurobiology
 Progress in Nuclear Energy
 Progress in Nuclear Magnetic Resonance
 Spectroscopy
 Progress in Oceanography
 Progress in Quantum Electronics
 Progress in Solid State Chemistry
 Progress in Surface Science

Quaternary Science Reviews
 Space Solar Power Review
 Water Science and Technology
 Plenum Publishing Corp.
 Advances in Experimental Medicine and Biology
 Advances in Human Genetics
 Advances in Microbial Ecology
 Advances in Nuclear Physics
 Advances in Nutritional Research
 Comprehensive Virology
 Contemporary Topics in Immunobiology
 Contemporary Topics in Molecular Immunology
 Evolutionary Biology
 Raven Press
 Advances in Biochemical Psychopharmacology
 Advances in Cyclic Nucleotide and Protein
 Phosphorylation Research
 Advances in Pain Research and Therapy
 Advances in Prostaglandin, Thromboxane, and
 Leukotriene Research
 Atherosclerosis Reviews
 Frontiers in Neuroendocrinology
 D. Reidel Publishing Co.
 Geophysical Surveys
 Space Science Reviews
 Royal Society of Chemistry
 Chemical Society Reviews
 Natural Product Reports
 Springer-Verlag
 Advances in Anatomy, Embryology and Cell
 Biology
 Advances in Polymer Science
 Current Topics in Microbiology and Immunology
 Recent Results in Cancer Research
 Residue Reviews
 Reviews of Physiology, Biochemistry and
 Pharmacology
 Springer Tracts in Modern Physics
 Structure and Bonding
 Topics in Applied Physics
 Topics in Current Chemistry
 Taylor & Francis Inc.
 Advances in Physics
 Contemporary Physics
 John Wiley & Sons Inc.
 Advances in Chemical Physics
 Advances in Electrochemistry and Electrochemical
 Engineering
 Advances in Enzymology and Related Areas of
 Molecular Biology
 Mass Spectrometry Reviews
 Methods in Biochemical Analysis
 Organic Reactions
 Progress in Drug Metabolism
 Progress in Inorganic Chemistry
 Progress in Physical Organic Chemistry

Health Science Center, San Antonio, examined 50 medical review articles published in four major journals between June 1985 and June 1986. After carefully assessing the articles on such criteria as specified purpose, data selection, and data synthesis, Mulrow

concludes that current medical reviews do not routinely use systematic methods to identify, assess, and synthesize information. She offers several recommendations to improve the process by which reviewers not only collect, analyze, and integrate information but

also identify gaps in present knowledge and suggest future initiatives. "By using systematic methods of exploration, evaluation, and synthesis," writes Mulrow, "the good reviewer can accomplish the task of advancing scientific knowledge."⁵

Chauncey Leake, one of my earliest mentors, about whom I have written frequently,⁶ stimulated my interest in the importance of reviews. For more than 15 years, in fact, he wrote a column in the *Annual Review of Pharmacology* entitled "Review of Reviews." Chauncey valued review articles not only for integrating and synthesizing scientific accomplishments but also as a tool for information retrieval. As I observed in the course of studying reviews, the structure of sentences in a review article, where a sentence is followed by a citation, corresponds to the structure of a traditional subject index. Chauncey's emphasis on the value of reviews had great influence on me.

The new *Annual Review of Computer Science* features an introduction by Joshua Lederberg, president, Rockefeller University, New York. I'll conclude this essay with his thoughts on the value of reviews: "It has become difficult if not impossible for the scientist in most specialties to keep up with the primary literature in a given field, and all the more to remain literate in broader aspects of scientific research. The review thus plays an indispensable role in connecting the individual with the broader scientific culture...."⁷

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