



Current Comments®

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**Launching the *ISI Atlas of Science*:
For the New Year, a New Generation
of Reviews**

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The beginning of the year is traditionally the time to review the past, assess the present, and think about the future. In this spirit, we are turning our attention to the *ISI Atlas of Science*®. This guide to science has undergone many developmental stages including two prototype volumes that I have described previously.^{1,2} In this, my first essay of 1987, I am pleased to introduce the first section in a new and totally revised format—the *ISI Atlas of Science: Pharmacology*.

The *ISI Atlas of Science* is a guidebook to research that combines the power of computer-aided citation analysis with the expert interpretation of leading scientists. ISI® commissions surveys of currently active areas of research from specialists in those fields and brings related surveys together in a single section of the *Atlas*. Each of the 12 discipline-related sections now planned will appear quarterly to provide researchers with timely access to new developments.

Research-Front Analysis

The *ISI Atlas of Science* provides readers with authoritative, systematic, and easily read surveys of active research areas. Each survey is the result of a long process of analysis and editorial activity, involving a sophisticated use of ISI's unparalleled bibliographic database. This database contains the titles, authors, addresses, and citations collected from about 740,000 articles each year from over 4,800 journals in science and social science. These data derive from ISI's production of the *Science Citation Index*®,

the *Social Sciences Citation Index*®, and *Current Contents*® (CC®).

To identify the most-active concentrations of research activity for the *Atlas*, we first identify the most-cited articles from a year's literature. Then, using co-citation analysis, we look for those papers that are most frequently cited together. Core papers associated in this way are likely to share common features, such as topics, results, methods, or conclusions. Co-citation associations between the most-cited papers in a field produce clusters of related papers that we call research fronts. The results of our research-front analyses form the basis for the *ISI Atlas of Science*.

Research-front analysis creates a unique picture of the world of science by highlighting areas of activity and illuminating relationships between research fields that might otherwise be missed. It provides objective information about intensively researched or emerging fields, as well as overall trends. Further, unfashionable or otherwise neglected areas can be pinpointed in a way not possible by subjective means. We have long felt that the information revealed by research-front analysis would be of great value to scientists, teachers, librarians, and others who need access to the scientific literature. How to present the material was a significant challenge.

Market Research

Many CC readers are familiar with the *ISI Atlas of Science* as it was conceived in the

Table 1: Discipline-related sections of the *ISI Atlas of Science*[®]. The year a section will first be published is indicated in the left margin. Section titles and disciplinary breakdowns are provisional for later years.

1987	}	1. PHARMACOLOGY Pharmacology, pharmaceutical sciences, drug development, medicinal chemistry, toxicology, carcinogenesis, mutagenesis, clinical pharmacology.
	}	2. BIOCHEMISTRY Biochemistry, molecular biology, molecular genetics, biophysics, microbiology, molecular physiology, other molecular-level biological subjects.
1988	}	3. IMMUNOLOGY Immunology, cell biology, cell-cell interactions, development and developmental genetics.
	}	4. ANIMAL AND PLANT SCIENCE Physiology, endocrinology, reproductive biology, agricultural and veterinary biology, ecology, evolution, plant science, applied biology, environmental science.
	}	5, 6. CLINICAL SCIENCES (Parts 1 and 2) Oncology, cardiology, infectious diseases, surgery, internal medicine, other clinical areas.
1989	}	7. NEURO- AND BEHAVIORAL SCIENCE Neuroscience and neurophysiology, ethology, behavioral science, psychology and cognition, sensory physiology, abnormal psychology and psychiatry.
	}	8. PHYSICS AND MATHEMATICS Subatomic physics, astrophysics, mathematics, computer science.
	}	9. GEOSCIENCES Geology, meteorology, oceanography, atmospheric and planetary science.
	}	10. SOCIAL SCIENCES Sociology, political science, law, economics, social anthropology, history.
1990	}	11. PHYSICAL CHEMISTRY Solid-state physics, optics, crystallography, hydrodynamics, molecular chemistry, etc.
	}	12. STRUCTURE, SYNTHESIS, APPLICATION Materials, analytical chemistry, instrumentation, synthetic chemistry, applied physics and mathematics.

two prototype volumes I mentioned earlier: *Biochemistry and Molecular Biology 1978/80*³ and *Biotechnology and Molecular Genetics 1981/82*.⁴ Each volume contained data on over 100 research fronts, including a review and/or a bibliography, and a cluster map for every research front.

Subsequently, under the guidance of Alexander ("Sandy") Grimwade, director of ISI's *Atlas* division, an extensive program of research and development was inaugurated. Sandy, who received a PhD in biochemistry from the University of Edinburgh, UK, served as an assistant editor at *Nature* and as publisher of several monthly review journals for Elsevier Publications, Cambridge, UK, before joining ISI. His broad background in science publishing, combined with his research experience, made him especial-

ly well qualified to develop this innovative guide to science.

Initially, Sandy conducted a survey of prominent scientists to evaluate the value of the results of the objective research-front analysis as compared with the subjective opinions of the experts consulted. He found that the respondents considered research-front analysis an excellent tool for defining active research areas and useful in identifying active individuals in specific fields.

He then followed this questionnaire with a series of informal discussions and formal surveys of scientists, librarians, and potential users of the *Atlas* to learn more about their information requirements. All of this, together with our earlier experience, enabled us to create a new *Atlas*, a publication unprecedented in the literature of science.

Table 2: ISI Atlas of Science® Editorial Advisory Board—Pharmacology.

Mordecai P. Blaustein University of Maryland School of Medicine Baltimore, MD	Irwin J. Kopin National Institutes of Health Bethesda, MD
Floyd E. Bloom Scripps Clinic & Research Foundation La Jolla, CA	Louis Lasagna Tufts University Boston, MA
Douwe Breimer Centre for Bio-Pharmaceutical Sciences Leiden, The Netherlands	Robert J. Lefkowitz Howard Hughes Medical Institute Research Laboratories Durham, NC
Geoffrey Burnstock University College London, UK	Michael J. Parnham A. Nattermann & Cie. GmbH Cologne, FRG
Arvid Carlsson University of Goteborg Goteborg, Sweden	Alfred Pletscher Kantonsspital Basel, Switzerland
Allan H. Conney Roche Institute of Molecular Biology Nutley, NJ	Marcus Reidenberg New York Hospital-Cornell Medical Center New York, NY
Erminio Costa Fidia-Georgetown Institute for the Neurosciences Washington, DC	G. Alan Robison University of Texas Health Science Center Houston, TX
James R. Fouts National Institute of Environmental Health Sciences Research Triangle Park, NC	Merton Sandler Institute of Obstetrics and Gynaecology University of London London, UK
Nelson Goldberg University of Minnesota Medical School Minneapolis, MN	Ulrich Schwabe University of Heidelberg Heidelberg, FRG
Leslie L. Iversen Merck Sharp & Dohme Research Laboratories Harlow, UK	Solomon Snyder Johns Hopkins University Baltimore, MD
John W. Keabian Abbott Laboratories Abbott Park, IL	John H. Weisburger Naylor Dana Institute for Disease Prevention Valhalla, NY

The new *ISI Atlas of Science*, as a series of periodical publications, will contain concise surveys, written by experts, on subjects identified by the research-front analysis of the database. Each survey will systematically cover the background, current status, and future prospects of the subject and include a bibliography, a list of key researchers in the field, and a glossary to help explain unfamiliar terms and abbreviations. As mentioned, we will publish quarterly issues within each disciplinary section to ensure that users have the most up-to-date reviews. At

the end of each year, we will publish comprehensive indexes to each section.

Table 1 lists the subject areas that the 12 sections of the *Atlas* will cover. In order to give a logical structure to the *Atlas*, we decided to divide it by subject area rather than by the alphabetic order used in traditional reference works. The subject-area divisions will undoubtedly be questioned by some; nevertheless, they represent areas that are equal in size and that correspond to groups formed by cluster analysis. Each section represents a broad subject area. For instance,

Table 3: A partial list of invited authors and survey subjects to be included in the *ISI Atlas of Science®: Pharmacology* in 1987.

INVITED AUTHOR	SUBJECT
Helmut Bartsch	The Ames test
N.J.M. Birdsall	Characterization of muscarinic cholinergic receptors
K.W. Bock	Drug conjugation in the liver
P. Braquet	The promise of platelet-activating factor
M.A. Bray	Immune regulation by prostaglandins and other lipid mediators
Otto-Erich Brodde	Cardiac beta-adrenergic receptors
H.R. Brunner	Angiotensin converting enzyme inhibitors
D. Calne	Use of dopaminomimetic drugs in treatment of Parkinson's disease
Marc G. Caron	Dopamine in the anterior pituitary
C. Cauvin	Vascular effects of organic calcium ion antagonists
Ian Creese	Characterization of dopamine receptors
E. De Clercq	Antiviral nucleoside analogs
R.W. Estabrook	Model studies of cytochrome P-450 and related iron-porphyrin complexes
A.W. Ford-Hutchinson	Leukotrienes as mediators of inflammation
Mark S. Gold	Treatment of opiate withdrawal with clonidine
Francis J. Haddy	Endogenous digoxin-like factors
James L. Henry	Substance P and opioid peptides in regions of the central nervous system subserving nociceptors
J. Hughes	Opioid receptors and opioid peptides
D.V. Jackson	Vinca alkaloid chemotherapy
F.F. Kadlubar	Metabolism and DNA binding of carcinogenic aromatic amines
R.D. Kimbrough	Toxicology of polychlorinated hydrocarbons
B.N. La Du	Genetic polymorphism of drug metabolism
S.Z. Langer	Pharmacology of imipramine in depression
J.W. Langston	Neurotoxicity of MPTP and its relationship to Parkinsonism
John Laragh	Atrial natriuretic peptides
Guy Laurent	Aminoglycoside nephrotoxicity: cellular and molecular aspects
Josee Leysen	Serotonin receptors and antagonists
J. Lunec	Oxygen free radicals in inflammation
Richard J. Miller	Calcium channels and calcium antagonists
John Morley	Behavioral effects of peripherally administered cholecystokinin
Heinz Nau	Valproic acid teratogenesis
S. Ragnar Norrby	Imipenem/cilastatin in the treatment of bacterial infections
Aurelio Ortiz	Plasma levels of neuroleptics in clinical treatment of acute psychotic states
H. Reuter	Techniques for the study of ion channels in the neuron membrane
R. Ruffolo	Drugs with alpha-adrenoceptor and beta-adrenoceptor antagonist properties
Christine C. Sanders	Resistance to beta-lactam antibiotics
M.C. Scaife	Current status of the eye irritancy test in toxicology
Kenneth B. Seamon	Forskolin and adenylate cyclase
A.M. Seppalainen	Organic solvent neurotoxicity
D.V. Sheehan	Pharmacology of treatment of panic and anxiety
S. Sherry	Coronary thrombolysis with streptokinase
I.F. Skidmore	Anti-allergic/anti-asthmatic drugs
Trevor Stone	Excitatory amino acid neurotransmitters and anticonvulsant drug action
A.J. Turner	Metabolism of enkephalins
P.M. Vanhoutte	Endothelium and responsiveness of vascular smooth muscle
P. Wardman	Hypoxic cell radiosensitizers in tumor therapy
S.P. Watson	Multiple receptors for substance P and other mammalian tachykinins
John H. Weisburger	Dietary causes of human cancer
Brendan J.R. Whittle	Gastro-protection by prostaglandins and their analogs
T.L. Yaksh	Pharmacology of spinal and intrathecal analgesia

the *ISI Atlas of Science: Pharmacology* not only includes surveys of research in pharmacology but also in toxicology, drug development, therapeutics, and medicinal chemistry.

We chose to launch the *ISI Atlas of Science* with the pharmacology section for several reasons. We found that this subject was especially amenable to the integrative approach of the *Atlas* and appeals to scientists working in academic, clinical, and industrial research. Further, pharmacology combines both basic and applied research, modern molecular biology, and traditional pharmaceuticals.

In January 1988 we will launch three more sections of the *ISI Atlas of Science: Biochemistry, Immunology, and Animal and Plant Science*.

Editorial Processes

As an essential first step in developing a section of the *ISI Atlas of Science*, we establish an editorial advisory board. For the *Atlas: Pharmacology*, a team of distinguished international experts in pharmacology and related fields was appointed. The members of the *Atlas: Pharmacology* board and their affiliations are listed in Table 2.

The results of the research-front analyses are given to board members, who screen the material to pinpoint those fields with the greatest impact in the research world and identify potential authors from among those scientists actively involved in each subject area. The addition of a human element enhances and refines the computerized analysis.

Next, we commission surveys from the authors recommended by the advisory board. We have been delighted with the overwhelmingly positive response of those invited. Authors seemed intrigued by the idea of combining a systematic method for pinpointing a specific research area with their own knowledge in the field. Table 3 lists the authors and survey topics currently scheduled to appear in the *Atlas: Phar-*

macology in 1987. Naturally, as time passes, we will undertake new cluster analyses and the topics covered will change. We expect to publish over 100 surveys per year in each subject section.

The *Atlas* Format

Each *Atlas* section will be published quarterly for timeliness, and each will follow a standard format for consistent quality. A quarterly, softcover issue of the *Atlas* will include from 20 to 30 surveys.

At year's end we will cumulate all the surveys in the quarterlies in an annual hard-bound volume for each section. These annual volumes will include author, subject, geographic, and institutional indexes to make searching the year's research surveys in that edition quick and easy. Each annual will also contain cluster maps—our unique representations of the interrelationships between survey topics.

This combination of quarterly issues and annual compilations creates a very flexible format for a wide variety of subscribers and users. Individuals may subscribe to the quarterlies in their own fields of interest. Specialized libraries will find the institutional subscription, which includes both the quarterlies and the annual compilation, of great value. For the large institutional library that wants to cover the whole spectrum of science, we have created a special Charter Subscription, which will allow the library to subscribe to all the subject sections as they appear, at substantial discounts. Full details are given in the box at the end of the essay.

Conclusion

The format, comprehensive coverage, and timeliness of the *Atlas* will appeal to many. Researchers can use the *Atlas* to keep current in their own fields or to find relevant information in fields outside their own. Teachers will find the surveys helpful in their own background reading or recommend them to graduate students. In particular, the reference list at the end of each sur-

vey is invaluable for students. And of course, librarians will be able to direct patrons to the *Atlas* as a convenient guide to current discussions of a wide variety of science fields.

The *ISI Atlas of Science*, in combining the objectivity and systematic coverage of co-citation analysis with the expert interpretation

of specialists, makes for a unique and essential tool for science researchers today.

* * * * *

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