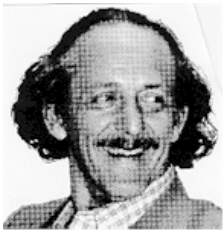

Current Comments

ISI/CompuMath, Multidisciplinary Coverage of Applied and Pure Mathematics, Statistics, and Computer Science, in Print and/or Online—Take Your Pick!

Number 10 March 8, 1982

At the beginning of 1981, I announced that ISI® would offer a series of *disciplinary* information services separately covering mathematics, biochemistry, plant sciences, and earth sciences.[1] This essay introduces our new package of information services called *ISI/CompuMath*™. The data base provides a variety of services to meet information needs in applied and pure mathematics as well as related fields—computer science, statistics, operations research, and management science. This new package, we believe, provides a cost-effective approach to retrieving information in industrial, government, and academic settings.

While it is not widely known, mathematics literature has been covered extensively in *Science Citation Index*® (*SCI*®) from its inception. However, as a multidisciplinary index, *SCI* is almost exclusively available in the main or central library at most universities. The reasons for this—economical and practical—are understandable, but the results are less than ideal. Most university researchers depend on departmental or personal libraries for most of their information needs. Thus, mathematicians generally are not aware of *SCI*'s relevance to mathematics. And in many cases when they are, few take the time to regularly check it. As a general rule, the use of libraries is inversely proportional to the square of the distance. This function becomes cubic when it is raining.

However, our goal in creating disciplinary data bases like *ISI/CompuMath* is not only to bring citation-based information services to the department library. Wherever researchers work, even at home, *ISI/CompuMath* makes it easier for mathematicians and others to access the "math" literature. To achieve this goal, we've created three basic *ISI/CompuMath* components—*Current Contents*®/*CompuMath* (*CC*®/*CompuMath*), a printed *CompuMath Citation Index*™, and *ISI/CompuMath* online.

All three components are derived from a data base that begins with over 350 "core" math publications. This includes about 40 journals and book series that were never covered in *SCI*.

In addition to this core coverage, *ISI/CompuMath selectively* covers about 4,000 science and social sciences journals in the ISI data base. Articles from these publications are selected for coverage on the basis of an algorithm that searches for core journals in their reference lists or for math words appearing in their titles. Thus, any article that cites a given number of the core math journals will be included in *ISI/CompuMath*. Table 1 gives a partial, introductory list of math terms used in the title word "profile."

This will expand *ISI/CompuMath*'s coverage not only into multidisciplinary journals but also into physics, engineering, and economics journals. Our coverage of applied math will be comprehensive as no other service can be. In some cases—like biometrics—citations to articles in those journals might be quite extensive. As a result of this selective and core coverage, we expect that a total of

Table 1: Partial list of words or word parts used to select articles from the entire ISI℠ data base for inclusion in *ISI/CompuMath*™.

CompuMath Keyword Profile

ABELIAN
AFFINE
ALGEBRA/
ALGORITHM/
ASYMPTOT/
BANACH
BERNOULLI
BINOMIAL/
BOOLEAN
BOUNDARY-VALU/
CALCULATE/
CALCULATION/
CANTOR/
CAUCHY/
COMPUTAB/
COMPUTATION/
COMPUTER-PROGRAM
COMPUTER-SIMULAT/
DIFFERENTIAL-OPERAT/
DIMENSIONAL-ANALYS/
EQUATION/
ERGODIC/
EUCLID/
FINITE-GROUP/
FOURIER
FOURIER-ANALYS/
FOURIER-SERIES
FRACTAL/
FUZZY-SET/
FUZZY-SYSTEM/
GAUGE-THEOR/
GAUSS/
HAMILTONIAN
HARMONIC-FUNCT/
HEURISTIC/
INFINITE-GROUP/
INTEGER/
ITERAT/
JACOBI
JORDAN-DEDEKIND
LINEAR-PROGRAM/
LOGIC
LOGICS
MATHEMATIC/
MATHEMATICAL-MODEL/
MEASUREMENT-THEOR/
MONTE-CARLO
NON-EUCLID/
NONEUCLID/
NON-LINEAR
NONLINEAR
NUMBER-THEOR/
NUMERIC/
NUMERICAL-SIMULATION/
OPERATOR-BUNDLE/
PERMUTATION-GROUP/
PI-ALGEBRA/
POISSON
POLYGON/
POLYNOMIAL/
PROBABILISTIC
PROFINITE-GROUP/
PSEUDODIFFERENTIAL-OPERAT/
QUEU/
RANDOM-NUMBER/
RANDOM-VALU/
RIEMANN/
SEMI-COMBINAT/
SEMICOMBINAT/
SET-THEOR/
STOCHASTIC
SUBHARMONIC-FUNCT/
SUMMABILITY
SYMPTOT/
TENSOR/
THEOREM/
TOPOLOGICAL
TOPOLOGY
UNITARY-GROUP/

over 30,000 current articles will be included each year in the *ISI/CompuMath* data base. The number of cited references will exceed 500,000 each year.

CC/CompuMath, the first component mentioned earlier, is the current awareness part of the package. It is issued monthly and has been available since July 1981. *CC/CompuMath* contains reproductions of contents pages from recent journal issues. Like the *CC* edition you are reading, *CC/CompuMath* alerts you to articles of interest in journals you don't see regularly. It gives you all the bibliographic information needed to access the journal in your library. Of course, journal articles are also available through ISI's *Original Article Text Service* (*OATS*®).

The second component, *CompuMath Citation Index,* is designed for retrospective literature searches. *CompuMath Citation Index* includes a Source Index, Citation Index, and Permuterm® Subject Index, similar in many respects to *SCI, Social Sciences Citation Index*® (*SSCI*®), and *Arts & Humanities Citation Index*™ (*A&HCI*™). It will be

issued annually in hardcover starting with the 1981 annual, which will be available in May 1982.

In addition, two interim triannual issues of *CompuMath Citation Index* will be published in soft-cover. Each triannual issue covers a separate four-month period—the hardcover annual cumulation includes the final four-month period. One of the compelling reasons for the new *CompuMath Citation Index* is that we will be able to use larger print. We will also include in the Source Index the complete list of references cited by each source paper. These are features we adopted in *SSCI* several years ago.

The third component is *ISI/CompuMath* online. The online file covers at least five years of the literature — from 1976 to date. It is updated *every month.* This timely and extensive data base allows you to conduct *both* current awareness and retrospective searches of the math literature. It is accessed through the ISI Search Network, through Telenet and Tymnet. *ISI/CompuMath* online has been available since October.

ISI/CompuMath online is designed to put a highly focused bibliography in your hands in a matter of minutes. It can be searched by cited or source author, title words, institutional affiliations, cited references, source journal, year of publication, document type, language, and by a new and highly efficient method called "research front specialty searching." I've recently described this new approach to automatic indexing, or classification, in detail.[2]

Research front specialties are discrete, interacting, and sometimes overlapping areas of current research. ISI identifies research front specialties through co-citation analysis. Highly cited papers are frequently cited *together* (co-cited) by current researchers, and they form "clusters" that are closely identified with emerging research specialties. The co-*cited* documents make up the core papers or books in the cluster. The *citing* papers constitute the current part of the research front.

The online user of *ISI/CompuMath* is provided with the *Index to Research Fronts in ISI/CompuMath.*[3] The index lists each specialty name and its corresponding code number. Table 2 shows a sample of a few of the 3,035 research front specialties included in the *ISI/CompuMath* data base. These names are derived from the words or phrases most often used by authors working in these fields. This computerized procedure directly reflects current research activity without the subjective judgments of indexers. However, the specialty names have been edited by mathematicians to provide syntactically meaningful names.

Once you locate the research front you're interested in, you simply enter its code number into the terminal to begin your search. Suppose you're interested in torus theorems. In Table 2, there is a research front entitled "Annulus and torus theorems, Seifert fibered-spaces, and fundamental-groups for 3-manifolds." After you enter the code number, 80-2776, into the terminal, you'll see what is shown in Figure 1. The terminal displays the name of the research front which verifies that you keyed in the correct number. The terminal also shows how many papers or "hits" are included in the specialty.

You know that this research front contains 121 papers. You can command the terminal to display bibliographic information on *all* 121 papers by keying in PRINT. Instead, you may want to retrieve a smaller subset of papers. For example, you may be interested only in those papers written by a particular author, at a specific institution, in a given year and language, and so on. Another convenient way to organize the 121 papers in this research front is by "specialty weight," or relevance. That is, you can find out which of the 121 specialty papers cite the most core papers.

Figure 2 gives an example of a specialty weight search. After you key in the command, EXPAND SPWT = 80-2776, the computer ranks the 121 papers in the research front according to how many

Table 2: Sample section from alphabetic *Index to Research Fronts in ISI/CompuMath*™

d. base.

ANGULAR-LINEAR-DISTRI

ANGULAR-LINEAR-DISTRIBUTIONS
ANGULAR-LINEAR-DISTRIBUTIONS, VON-MISES-FISHER-DISTRIBUTIONS, and DIRECTIONAL-DATA 80-2618

ANGULAR-MOMENTUM
ANGULAR-MOMENTUM, MONOPOLES, FLUX-QUANTIZATION, and QUANTUM-KINKS in nonabelian GAUGE-THEORIES ... 80-1933

ANGULAR-MOMENTUM-DECOUPLING
MOLECULAR-LINE-BROADENING calculations, PRESSURE BROADENING-THEORY, and ANGULAR-MOMENTUM-DECOUPLING approximations 80-0194

ANHARMONIC-OSCILLATORS
ANHARMONIC-OSCILLATORS, PERTURBATION-THEORY for WAVE-EQUATIONS, and FUNCTIONAL-INTEGRATION through INVERSE-SCATTERING-TRANSFORMS 80-0436
BOREL-SUMMABILITY and ANHARMONIC-OSCILLATORS 80-0581
COHERENT STATE-REPRESENTATIONS of DAMPED OSCILLATORS and COUPLED ANHARMONIC-OSCILLATORS ... 80-0671

ANIMAL-FEEDING-STRATEGIES
MATHEMATICAL-MODELS for PEST-MANAGEMENT and INFECTIOUS-DISEASES, dynamic OPTIMIZATION in ANIMAL-FEEDING-STRATEGIES, and OPTIMAL-CONTROL in some CHEMOTHERAPY problems 80-1925

ANISOTROPIC
CORRELATION-FUNCTIONS and GREENS-FUNCTIONS of ANISOTROPIC HEISENBERG FERROMAGNETS 80-2879
FLOW-ALIGNMENT in LIQUID-CRYSTALS, NEMATIC ISOTROPIC PHASE-TRANSITIONS, and COMPUTER-SIMULATION of ANISOTROPIC systems 80-2598
INFINITE ISOTROPIC and ANISOTROPIC HEISENBERG-CHAINS and solution methods for the 2-DIMENSIONAL model ... 80-0532
SURFACE-WAVES in ANISOTROPIC and ORTHORHOMBIC ELASTIC-MATERIALS 80-1641
TRAJECTORIES in ANISOTROPIC KEPLER-PROBLEM, and PATH-INTEGRALS and ERGODIC MOTION in QUANTUM-MECHANICS 80-2056

ANNIHILATION
ANNIHILATION in QUANTUM-CHROMODYNAMICS and ASYMPTOTIC-FREEDOM in nonabelian GAUGE-THEORIES 80-2025

ANNULUS
ANNULUS and TORUS theorems, SEIFERT FIBERED-SPACES, and FUNDAMENTAL-GROUPS for 3-MANIFOLDS 80-2776
KNOTS, SEIFERT FIBERED-SPACES, and the ANNULUS and TORUS theorems for 3-MANIFOLDS 80-1022

ANOMALOUS-FLUCTUATI

ANOMALOUS-FLUCTUATIONS
SCALING theory of ANOMALOUS-FLUCTUATIONS, and nonlinear RELAXATION of 1ST-ORDER PHASE-TRANSITIONS 80-0685

ANOSOV-FLOWS
ANOSOV-FLOWS and expansion mappings 80-0296

ANRS
CELL-LIKE mappings, the MAPPING-THEOREM, the MAPPING-CYLINDER-THEOREM, HILBERT-CUBES, and ANRS 80-1106

ANTISYMMETRIC
FIELD-STRENGTH, EXTENDED systems, and ANTISYMMETRIC TENSOR GAUGE-FIELDS 80-2332

APERTURES
ELECTROMAGNETIC DIFFRACTION by various APERTURES : uniform ASYMPTOTIC-THEORY, RAY-TECHNIQUES, and GEOMETRICAL OPTICS 80-0074

APPLICATIVE-PROGRAMMING
IMPROVEMENTS of CODES via LAZY-EVALUATION and APPLICATIVE-PROGRAMMING for PARALLEL-PROCESSING 80-1784

APPLIED-MATHEMATICS
HIDDEN GAUGE-SYMMETRY, CLASSIFICATION of SU(3) MAGNETIC MONOPOLES, and BIFURCATION and SYMMETRY-BREAKING in APPLIED-MATHEMATICS 80-2665

APPLIED-SCIENCE
Solution of linear COMPLEMENTARITY-PROBLEMS by LINEAR-PROGRAMMING, with applications in ENGINEERING and APPLIED-SCIENCE 80-1319

APPORTIONMENT
QUOTA-METHOD, HUNTINGTON-METHOD, JEFFERSON-METHOD, and WEBSTER-METHOD of APPORTIONMENT .. 80-0423

APPROXIMATE-ROOTS
APPROXIMATE-ROOTS of POLYNOMIALS and ALGEBRAIC PLANE-CURVES 80-0011

APPROXIMATELY
Structure of simple and APPROXIMATELY FINITE-DIMENSIONAL CSTAR-ALGEBRAS 80-0855

APPROXIMATION-IN-MEAN
APPROXIMATION-IN-MEAN by POLYNOMIALS and by solutions of ELLIPTIC-EQUATIONS in LP-SPACES 80-0385

APPROXIMATION-PROBLEMS
APPROXIMATION-PROBLEMS and capacity in function spaces 80-0038

APPROXIMATION-THEORY
APPROXIMATION-THEORY, INTEGRAL-KERNELS, and the TANGENTIAL CAUCHY-RIEMANN equations for REAL-SUBMANIFOLDS of CN 80-2123

core papers they cite. As you can see in Figure 2, 67 of the 121 papers cite one core paper, 36 cite two, nine cite three, two cite four, five cite five, and two cite six core papers. The computer indicates that there are no more hits—that is, all 121 papers are categorized. In this example, we've instructed the computer to focus on line six—the two papers that cite six core papers. The computer

Figure 1: *ISI/CompuMath*™ online search. Computer response to user's initial command to locate SP = 80-2776.

```
* SP = 80-2776
ANNULUS AND TORUS THEOREMS, SEIFERT
FIBERED-SPACES, AND FUNDAMEN-
TAL-GROUPS FOR 3-MANIFOLDS
SET 1: 121 HITS
```

Figure 2: *ISI/CompuMath*™ online search by specialty weight.

```
* EXPAND SPWT = 80-2776#
TYPE: SPWT
 1 (67)                    80-2776-01
 2 (36)                    80-2776-02
 3 (9)                     80-2776-03
 4 (2)                     80-2776-04
 5 (5)                     80-2776-05
 6 (2)                     80-2776-06
NO MORE HITS
ACTION? / GROUP 6
SET 2: 2 HITS

* PRINT 2

AN CM0030220
TI 3-MANIFOLDS
LA ENGLISH
DT BIBLIOGRAPHY, REVIEW
AU HEMPEL J
SO ANNALS OF MATHEMATICS STUDIES
   1976(86):3-191
YR 76
RF 115
ON VY949
SP 80-2776; 80-2534; 80-2173; 80-1829; 80-2056

AN CM0003801
TI TORUS THEOREM AND ITS APPLICA-
   TIONS
LA ENGLISH
DT ARTICLE
AU FEUSTEL CD
CS VIRGINIA POLYTECH INST & STATE
   UNIV, DEPT MATH, BLACKSBURG, VA,
   24061
SO TRANSACTIONS OF THE AMERICAN
   MATHEMATICAL SOCIETY 217 (MAR):1-43
YR 76
RF 18
ON BL351
SP 80-2776; 80-1022; 80-0687
```

groups these two papers and displays bibliographic information on them in response to our PRINT command.

As you can see in Figure 2, the bibliographic information displayed includes the full title of the document; authors' names; language; type of document; institutional addresses; journal title, pages, and publication year; the number of references it contains; the accession number that identifies the article; and the *OATS* number that identifies the journal. Note that the papers displayed also were assigned to other research fronts. To widen the search, you could key in their code numbers to see if these other specialties are relevant. The computer will respond with their names and the number of papers they contain, as in Figure 1.

This is actually one of six different formats available in *ISI/CompuMath* online. The other formats give you *more* information by including references cited in the articles you retrieve, for example. Or they give you *less* information by excluding the prefix labels, institutional affiliations, language; type of document, and so on. *ISI/CompuMath* online offers six different formats in order to provide as much or as little bibliographic information as the individual user needs.

As I indicated earlier, there is considerable duplication of mathematics literature in *SCI* and *ISI/CompuMath*. As long as a separate mathematics index did not exist, our coverage of this field in *SCI* had to be selective. Now our intention is to limit coverage of pure mathematics in *SCI* primarily to the high impact journals already covered. We will now increase coverage of mathematics within *ISI/CompuMath* to an extent that could not be justified earlier. This will retain the advantages of our multidisciplinary input for each discipline we want to cover intensively. The same approach will be adopted for earth sciences, agricultural/plant sciences, and other specialized data bases we are developing in chemistry.

A fourth component of this system which is under development simultaneously is the publication of a printed five-year cumulation of the *CompuMath Citation Index*. This will be the printed version of the 1976-1980 *ISI/CompuMath* online file. There are hundreds of users throughout the world

who will rely on printed indexes for many years to come. Indeed, as has been our experience with *SCI,* some of the heaviest users of the online files are also heavy users of our printed cumulations.

Since the original creation of the data base is an inherent cost of both print and online data bases, we designed two subscription policies for *ISI/CompuMath.* The print/online subscription costs $750 per year. Print subscribers receive the annual Citation Index and the two triannual editions. Those institutions requesting multiple copies of the Citation Index will receive a 50 percent discount on additional copies. Also, new print subscribers will receive 12 monthly issues of *CC/CompuMath* free of charge. For those who need extra copies of *CC/CompuMath,* they will cost $125 per year. In addition, print subscribers can use *ISI/CompuMath* online at a rate of $50 per hour. This does not include communication charges. Ironically, these charges are often higher in Europe than our online charge! But in the US, this is usually less than $7.00 per hour.

The *ISI/CompuMath* data base also will be available to online-only subscribers for $750. This amount represents an "upfront credit" that buys about five hours of online services. Again, this does not include communication charges. After that, online subscribers can search the *ISI/CompuMath* data base at a rate of $150 per hour. New online subscribers also will receive 12 issues of *CC/CompuMath* at no extra cost. Again, additional copies will be available at $125 per year. Incidentally, we plan to continue to cover the core math journals in *CC/Physical, Chemical & Earth Sciences* and *CC/ Engineering, Technology & Applied Sciences.*

The printed version of the 1976–1980 *CompuMath Citation Index* cumulation will be sold separately and will be published in December 1982. It will be available for $2,000 until December 31, 1982. But as of January 1, 1983, this five-year cumulation will cost $3,000. This allows you time to plan and order at the prepublication price. The 1981 annual Citation Index will be sold as a back issue for $750. Lastly, the *ISI/CompuMath* data base will be available on magnetic tape. Current year tapes will cost $6,000 and back year tapes will cost $3,000 each.

For more information on these services, you can write Gerald Francis, Manager of Product Development, ISI, 3501 Market Street, University City Science Center, Philadelphia, Pennsylvania 19104, USA. Or you can call toll-free in the US at (800) 523-1850, ext. 1389. Readers abroad can contact the offices listed at the beginning of each issue of *CC.*

* * * * *

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