

UNIVERSITY OF SOUTH FLORIDA
Department of Mathematics
Curriculum Vita

William Richard Stark
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813-980-3093

I. POSITIONS:

Chairman, Department of Mathematics	August 1994-August 1998
Full Professor	Fall 1996-present
Associate Professor	1978-96
Member of Graduate Faculty	January 1990-present
University of South Florida, Mathematics Department Fowler Avenue, Tampa, FL 33620	
Member of Technical Staff	1985-87
AT&T Bell Laboratories, Whippany, NJ 07981	
Consultant in Mathematics	1983-85
Center for Electronic Command and Communication U.S. Army, Fort Monmouth, NJ 07703	
Assistant Professor	1977-78
California State University at San Jose Mathematics Department, San Jose, CA 95192	
Research Instructor (a temporary post-doctoral position)	1974-77
University of Texas, Mathematics Department, Austin, TX 78712	

II. EDUCATION:

Ph.D. in Mathematics (Foundations, Analysis, and Computer Science) from the University of Wisconsin, Madison, Wisconsin, in December 1975.

Doctoral Dissertation Topic: Independence Results in Recursive Set Theory With Applications in Higher Order Logic.

B.S. in Mathematics and Physics from the University of Kentucky, Lexington. Graduate study in: mathematical logic, mathematical analysis, model theory, and theoretical computer science.

Other education: Chairing an Academic Department (3 days, Florida State University at Mission Inn Resort, October 1994), Writing Winning Grants (1 day, USF, 21 October 1993), Active Learning Workshop (2 weeks, USF, Summer 1992), Molecular Cell Biology (USF, Fall 1991), Microprocessor Design and Programming (AT&T Bell Laboratories, 1986), Contemporary Electronics (McGraw-Hill Continuing Education Center, 1985), EEL 6764 -- Principles of Computer Architecture (USF, 1983), AMS Short Course in Statistics (San Antonio, 1980).

III. AREAS OF RESEARCH:

Analytic, logical, and algebraic theory of parallel computation and distributed processes; random and asynchronous packet switching networks; asynchronous cellular automata, biological information processing; mathematical logic; algebra.

IV. BOR, UNIVERSITY, COLLEGE, AND DEPARTMENTAL SERVICE:

Board of Regents, Florida State University System:

1991-96 BOR Review of Department of Mathematics (USF), developed July-Sept. 97.

University:

The I-4 High-Tech Corridor (a conference in Orlando, October 1997).

Provost's Task Force on Scientific Computing (1990-91). This committee, chaired by Tony Llewellyn, developed a plan advising the Provost on networking, computing, and computing support needs in Natural Sciences, Engineering, and Medicine. I spearheaded the networking subcommittee and wrote its position paper.

Committee for Computing in Teaching and Research (1988-90).

College of Natural Sciences:

Joint Engineering and Natural Sciences Supercomputer Planning Committee (1987-90).

Chairman of Natural Sciences Computer Planning Committee (1988-89). Under my chairmanship, the new (post-Harris) plan for the CNS's Scientific Computing Center was developed. We all fought long and hard for the success of the scientifically up-to-date plan which is now in place.

Department of Mathematics:

Publicity Committee (1997-present).

Colloquium Committee (1993-94), Chair.

Chairman's Advisory Committee (1991-93).

Colloquium Committee (1990-91).

Space Committee (1990-91).

Chairman's Advisory Committee (1987-90), Chair.

New Appointments Committee (1987-88, 1989-90).

Computer Language Examination Committee (1984, 1987-90).

Graduate Committee (1984, 2003).

Computer Planning Committee (1983, 1984).

Graduate Committee (1982), Chair.

Colloquium Committee (1983), Chair.

V. PUBLICATIONS, ETC.:

My primary area of research involves the development of algebraic, logical, topological and analytic tools for the analysis and synthesis of parallel computations and distributed processes, especially as seen in biological information processing. My primary achievement in recent years is the development of tractable mathematics for investigating the global behavior of asynchronous cellular automata—a problem dating back 30 years to J. VonNeumann and S. Ulam.

Textbook:

LISP, Lore and Logic, by Springer-Verlag, New York and Berlin. February 1990. Most LISP texts focus on its use in artificial intelligence. This advanced mathematics/computer science text is the first to focus on LISP's mathematical foundations—the source of its exceptional power. To an extent, I developed LISP as Professor McCarthy originally conceived it—as a computer language implementing recursion theory.

Articles in refereed publications:

A forcing approach to $st \prod_1^1$ reflection and $st \prod_1^1 = \sum_1^0$, Zeitsch. math. Logik u. Grundlagen d. math., Vol. 24, No. 5, pp. 467-479, 1978.

Type heirarchies and type level reduction, Cybernetica, Vol. 22, No. 5, pp. 17-31, 1979.
Supported by NSF 3610180450.

A measure of subgroup diversity, Journal of Algebra, Vol. 61, No. 2, 1979.

Martin's axiom in the model theory of L_A , Journal of Symbolic Logic, Vol. 45, No. 1, pp. 172-86, 1980.

Automatic model construction. Information Sciences, Vol. 22, No. 2, pp. 90-102, 1980.

Logics of knowledge, Zeitsch. math. Logik u. Grundlagen d. math., Vol. 27, No. 2, 1981.

Homeostasis in synchronous distributed computations: a formal view. Information Sciences, pp. 151-69, Vol. 30, No. 4, 1983. (CP p. 190, April 1986).

A glimpse into the paradise of combinatory algebra, International Journal of Computer and Information Sciences, Vol. 13, No. 3, 1984.

Parameterized models of distributed processes. Cybernetica, Vol. 27, No. 4, 1984.

A parallel minimum spanning tree algorithm in LISP (with Dr. Leon Kotin). Presented to the 16th International Conference on Combinatorics, Graph Theory and Computing. Published in Congressus Numeratum, Vol. 58, 1985.

Logic Programming (a refereed technical correspondence). Communications of the ACM, p. 331, Vol. 29, No. 4, April 1986.

Thoughts on mechanical societies: or distributed processing in a random and changing environment (with Leon Kotin). Presented to the 17th International Conference on Combinatorics, Graph Theory, and Computing. Published in 1987 by Congressus Numeratum, Vol. 60, pp. 221-242.

A logic for distributed processes. Zeitsch. math. Logik u. Grundlagen d. math., Vol. 35, No. 4, August 1989.

The traveling salesman problem: some approximate algorithms (with Leon Kotin). Presented at the 19th International Conference on Combinatorics, Graph Theory and Computing (1988). August 1989 in Congressus Numeratum.

The social metaphor for distributed processing. Journal of Parallel and Distributed Computing, Vol. 6, No. 4, August 1989.

Terribly technical writing. Chapter 6 of Writing and Publishing for Academic Authors, University Presses of America, 1992, New York.

On the complexity of deadlock-free programs on a ring of processors (with Edwin Clark and Greg McColm). J. of Parallel and Distributed Computing, Vol. 16, 1992 (all three authors shared the credit for this item equally).

Tissue models, with programming problems from God's Notebook. ACM Special Interest Group in Biological Information Processing, 1992.

Artificial Tissue. Chapter 12 in the book Computing with Biological Metaphors, (Edited by R. Paton), published by Chapman & Hall, London, 1994.

Mathematics for a Fundamental Problem in Biological Information Processing (with computer programming by Dr. John Pedersen), accepted, IEEE International Conf. on Intelligence in Neural and Biological Systems, Washington, D.C., 29 May 1995.

Asynchronous, irregular automata nets: the path not taken (with Bill Hughes, student) BioSystems, v. 55, pp. 107-117, Spring 2000.

Dynamics for a Fundamental Problem of Biological Information Processing, Journal of Artificial Intelligence Tools, Spring 1996.

Graph Isomorphisms and the Evolution of Cooperation (with J. Pedersen and S. Suen), The Boca Raton Combinatorics and Graph Theory Conf., March 1994.

$f' = f \circ f$, East-West J. of Mathematics, Hue Univ., May 2002.

Other papers not yet submitted:

Asynchronous Complexity, presented at the First Pacific Rim Conference on Mathematics, Hong Kong, 1998, in the Southeast Asian Bulletin of Mathematics (Springer).

Ergodic theory of first-order properties of asynchronous distributed processes.

0,1-laws for asynchronous random Boolean nets (with Jim Lynch).

Asynchronous activity and local entropy reduction: an approach to natural information processing.

Quick proofs of asynchronous consensus and j -set agreement.

ABC Entropy, (an expository paper), started March 1997.

The topology and analysis of first-order properties of asynchronous distributed computation (parts I and II), submitted to Information and Computation, July 1996.

100% Distributed Wakeup, submitted to the 6th International Conference on Concurrency Theory.

Quick Proofs of Generic Consensus and j -Set Agreement, in the works since spring 1996.

Synchronization and oscillation in a biologically-motivated model of distributed computation (with J. Pedersen).

Local algebra to global algebra: steps toward an algebra of synchronous distributed computation (with John Pedersen).

The best of these “not yet submitted” papers is presented with examples in the 2002-2004 monograph I am completing this spring.

Unpublished research at AT&T:

There are about 15 technical memos written during my years at Bell Labs which, because they are either AT&T proprietary or DOD classified, are not available for publication. This work concerns parallel computing. The next nine titles are of AT&T proprietary reports. The titles of the DOD reports are not listed.

NP-complete computations in a tree of processors, 1984.

An approximate algorithm for clique enumeration, 1985.

Pseudocode test programs for communications operations in DADO, 1987.

Computability in synchronous bit-oriented distributed architectures, 1986.

A concurrent LISP algorithm for clique enumeration, 1985.

A concurrent algorithm for component enumeration (programmed in LISP), 1985.

Moving the intelligence of clique-search to the host, 1985.

Complexity analysis for a concurrent LISP algorithm for clique enumeration, 1985.

#Calls polynomials for bounded-clique-search, 1985.

A #call-budgeting strategy for clique-search, 1986.

Experiment: speed estimation for clique-search, 1986.

Programming synchronous distributed processes by automatic theorem prover, 1993.

Unrefereed published items (including reviews):

Combinatory automata, Association of Computing Machinery's SIGACT News, winter 1984.

A general method of analysis for $st \prod_1^1$ reflection, and its application in logic, Notices of the AMS, January 1974.

A new compactness theorem for infinitary logic, Notices of the AMS, January 1975.

An application of Martin's Axiom in group theory, Notices of the AMS, January 1977.

Automatic construction of finite models, Notices of the AMS, January 1978.

Reviews of books and research papers (published):

Brain Power from “IEEE Intelligent Systems” by Shadbolt, December 2003.

2-by- n hybrid cellular automata ..., IEEE Trans. Comp., a review for ACM CR, 2000.

A brief history of cellular automata, ACM Comp. Surveys, a review for ACM CR, 2001.

Weakly Connected Neural Networks (Frank Hoppensteadt) (a full-length, professional-level Springer book), Computing Reviews, February 1998.

On the complementation of asynchronous cellular Büchi automata (by Anca Muscholl) in the ACM's Computing Reviews, April 1997.

Artificial Life: The Quest for a New Creation (Steven Levy), Computing Reviews, November 1993.

Token systems that self-stabilize (by Brown, Gouda, Wu) a review for Computing Reviews, December 1990.

The social metaphor for distributed computing, a review rebuttal for Computing Reviews, December 1990.

Finite Automata on infinite trees and subtheories of SKS (by A. Mostowski), Mathematical Reviews.

On natural complete sets and Gödel numberings (by J. Hartmanis), Mathematical Reviews.

The ultimate equivalence of iterated homeomorphisms is recursively unsolvable (by M. Karpinski), Mathematical Reviews.

Some remarks on the Lewis modal system SS (by Gao Hengshan), Mathematical Reviews.
On cellular graph automata and second-order definable graph-properties (by Gy Turan), Computing Reviews.

The complexity of the validity for dynamic logic (by K. Manders), Mathematical Reviews.

Interpreting second-order arithmetic in the monadic theory of order (by Y. Gurevich), Mathematical Reviews.

Propositional dynamic logic of programs: a survey (by Rohit Parikh), Mathematical Reviews.

Deterministic propositional dynamic logic: finite models, complexity and completeness (by Ben-Ari, Halpern & Pnueli), Mathematical Reviews.

Dynamic parallel memories (by Vishkin & Wigderson), Computing Reviews.

Parallel language recognition in constant time by cellular automata (by Sommerhalder & Westrhenen), Computing Reviews.

Distributive semantics for nondeterministic typed lambda-calculus (by E. Astesiano & G. Costa), Computing Reviews.

Truth, Negation and Contradiction (by G.H. Wright), Mathematical Reviews.

The glory of the past (temporal logic) (by Lichtenstein, Pnueli & Zuck), Mathematical Reviews.

Effectively given domains and λ -calculus models (by Paola & Longo), Computing Reviews.

Applications of circumscription to formalizing common-sense knowledge, (by John McCarthy), Mathematical Reviews.

On the satisfiability of circumscription (by Lifschitz), Mathematical Reviews.

Completeness results for circumscription (by Perlis & Minker), Mathematical Reviews.

A program logic with quantifiable propositional variables (by Orłowska), Mathematical Reviews.

Linear and branching structures in the semantics and logics of reactive systems (by Pnueli), Mathematical Reviews.

A computational interpretation of truth logic (by R.J.R. Black), Mathematical Reviews.

Neural Networks for Computing (Amer. Inst. of Physics Conference 151), in the Applied Artificial Intelligence Reporter, 1987.

The laws of Occam programming (by Roscoe & Hoare, Theoretical Computer Science), Mathematical Reviews, February 1989.

The Illusion of Reality (a text by Howard Resnikoff, published by Springer), for Computing Reviews, March 1989.

Distributed Computing: Structure and Complexity (a book by H.L. Bodlaender), for Computing Reviews, June 1988.

A completeness theorem for dynamic logic (G. Laszlo), Mathematical Reviews, 22 March 1985.

Connectionist architectures for artificial intelligence (S. Fahlman & G. Hinton), Computing Reviews, July 1987.

Applications of the connection machine (D. Waltz), Computing Reviews, July 1987.

Parallel processing of encoded bit strings (A. Wu & A. Rosenfield), Mathematical Reviews, 1988.

Unpublished items:

The Department of Mathematics at USF: 1991-96 Self-Study for Board of Regents, 1997.

Neural Networks: A Primer for Mathematicians, 1987.

Kripke models and the logic of knowledge, 1990.

MK: a modal logic of model-theoretic reasoning, 1982, (35 pages of results on the non-monotonic logic LK).

Logics of Knowledge, 1983.

Army Project – Progress Report, 1984.

Logical Algebraic Foundations for Reasoning Mechanisms, final report to U.S. Army, 1985.

A solution to McCarthy's wise-man-puzzle problem, 1984.

Compactness and completeness for uncountable languages, 1979.

A language for wise men and multiprocessor systems, 1980.

A theory of distributed computation based on individual behavior, 1981.

A formal theory of individual behavior, 1980.

A Graduate Level Program for the Theory of Computation, 1989.

Proposed requirements for a combined five-year BS/MS program in the Mathematics of Computer Science. Department report, 1982.

Possible first steps toward a curriculum for the Mathematical Theory of Computation. Department report, 1979.

The Theoretical Computer Science Qualifying Exam, 1987.

Suggestions for an undergraduate curriculum in the mathematics of computation, report to the Computer Science Program Committee (jointly with Prof. Joseph Liang). Department report, November 1983.

Algebraic Tissue Builder and Stimulator, a LISP/graphics program, 1990.

Referee reports:

Conference organizing and refereeing for International Workshop on Information Processing in Cells and Tissues, Liverpool, 6-8 September 1997.

Conference organizing and refereeing for International Workshop on Information Processing in Cells and Tissues, Liverpool, 6-8 September 1995.

Stochastics in Back-Propagating Neural Networks (by Algis & Saulius) for Proc. Int'l. Conf. on Math. Analysis and Signal Processing (Editor: M. Ismail) 1994.

Theoretical foundations for a theory of non-monotonic learning automata (by M. Karpinski), refereed for Information and Control (Editor: Albert Meyer).

A structure processing facility for data flow computers (by Jack Dennis), refereed for IEEE Transactions on Computers (Editor: Oscar Garcia).

Fast parallel biharmonic semidirect solvers (by H. Goldstein), refereed for IEEE Transactions on Computers.

Distributed implementation of a model of communication and computation (by Aggarwal & Courcoubetis), refereed for IEEE Computer Society.

Proposal for the new Journal of Intelligent Systems (by Ronald Yager), for Wiley Interscience Journals.

Checking similarity of planar figures (by M. Atallah), refereed for the International Journal of Computer and Information Science (Editor: Julius Tou, Univ. of Fla.).

A complexity measure for data flow models (blind), refereed for the International Journal of Computer and Information Science (Editor: J. Tou).

For Academic Press, a proposal for a new journal in theoretical biology and computing titled Complexity, 1992.

Streaming Organisms for Ray Paton, guest editor, "ACM Special Interest Group in Computational Biology," 1992.

VI. INVITED SPEECHES/PRESENTED PAPERS/ CONFERENCE ORGANIZATION:

An Analytical Approach to Asynchronous Processes, (NATO) International Workshop on Cells and Tissue Modeling in Mathematics, Indianapolis, August 1999.

Ulam's Asynchronous Cellular Automata a Problem – the Solution, invited presentation at the Pacific Rim Conference on Mathematics, City University of Hong Kong, 20 January 1998.

Non-Linear Analysis and Differential Equations in an Unusual Product space (with Alexey Beliaev), presented to the International Conference on Non-Linear Differential Equations, Kiev, August 1997.

Asynchronous Automata Nets as an Artificial Tissue Model, invited colloquium talk, Chinese University of Hong Kong, 22 January 1998.

A Novel Nonlinear Dynamics, invited presentation to Second World Congress of IFNA, Athens, July 1996.

Abstract Dynamics for a Problem in Biology, International Conference on Nonlinear Differential Equations and Dynamics, Kiev, August 1995.

Mathematics for a Fundamental Problem in Biological Information Processing, with John Pedersen, accepted, IEEE International Conf. on Intelligence in Neural and Biological Systems, Washington, D.C., 29 May 1995. Voted to be one of the six best papers presented.

International Workshop on Information Processing in Cells and Tissues, Liverpool, 8 September 1995.

Graph isomorphism and the evolution of cooperation, by Pedersen, Suen and Stark, Graph Theory Conference, Boca Raton, 1994.

Topological methods for the analysis of distributed processes, Mathematics & Computer Science Departments, SUNY Binghamton, March 1993. A colloquium talk.

Algebraic Tissue – A mathematical model, invited 1 hour featured presentation at the 2nd Annual Ulam Mathematics Conference, Palm Beach, 4 April 1991.

A tutorial on artificial life, with David Jefferson (UCLA), invited 3 1/2-hour tutorial at IBM, Tampa, 21 March 1991.

A topological approach to proving properties of asynchronous distributed computations, at the “Mathematical Issues in Biologically Motivated Computing;” Special Session of the AMS Conference, Tampa, 23 March 1991.

LDP: A Logic for distributed processes, presented to Southeastern Logic Symposium, Miami Beach, March 1990.

The traveling salesman problem: some approximate algorithms, (delivered by Kotin, co-authored by Stark); presented to the 19th International Conference on Combinatorics, Graph Theory, and Computing, Baton Rouge, February 1988.

Thoughts on mechanical societies: or distributed computing in random and changing architectures, (delivered by Stark, co-authored with Dr. Leon Kotin); presented to the 17th International Conference on Combinatorics, Graph Theory, and Computing, Boca Raton, February 1986.

Types of distributed processes, invited talk given to the Mathematics Department of Stephens Institute of Technology, November 1985.

A parallel minimum spanning tree algorithm in LISP, (delivered by Stark, co-authored with Dr. Leon Kotin); presented to the 16th International Conference on Combinatorics, Graph Theory and Computing, Boca Raton, February 11-15, 1985.

Abstract algebra in theoretical science. An invited presentation to the Mathematics Department of Stetson University, DeLand, Florida, 1983.

LISP and functional computing. An invited talk for the IEEE Computer Society (South Florida chapter), Tampa, 1983.

An application of Martin's Axiom in group theory. A paper presented to the 83rd Annual Convention of the American Mathematical Society, St. Louis, 1977.

Automatic construction of finite models. A paper presented to the 84th Annual Convention of the American Mathematical Society, Atlanta, 1978.

A decision procedure for the logic of knowledge. An invited presentation at the Stanford Artificial Intelligence Laboratory, Stanford University, 1978.

Hilbert's program and the controversy in the foundations of mathematics. An invited presentation to the Mathematics Department of Stephen F. Austin State University, 1976.

Gödel's theorem and unsolvable problems in mathematics. An invited presentation at Texas Christian University, 1976.

A new compactness theorem for infinitary logic. A paper presented to the 81st Annual Convention of the American Mathematical Society, Washington, D.C., 1975.

Σ_1^1 analysis and its application in logic, an invited special session presentation to the 80th Annual Convention of the American Mathematical Society, San Francisco, 1974.

VII. OTHER CREATIVE ACTIVITY:

Program Development:

Beyond teaching and research, my assigned mission at USF was originally to develop a Theory of Computation program in the Mathematics Department. By Theory of Computation, I mean the heavily mathematical half of Theoretical Computer Science. Using this definition, Theory of Computation stands in relation to Computer Science as classical Applied Mathematics stands to Physics and Engineering.

The mathematics that is involved is advanced discrete mathematics, in particular: abstract algebra, mathematical logic, recursion theory, complexity theory, set theory, graph theory, combinatorics, number theory, coding theory, and linear algebra. The importance of discrete mathematics to Computer Science is a natural consequence of two things: (1) the digital (and therefore discrete) nature of modern computation; and (2) the central role of syntax and semantics in computer science, algebra(s) and mathematical logic. With increasing frequency computer science's deepest and most exciting problems have been solved using techniques from these areas of mathematics.

Toward the development of Theory of Computation as an applied mathematics for Computer Science, I have: (1) created new courses (listed below); (2) worked (successfully) to add new faculty members (Drs. McColm, Pedersen and Jonoska) specializing in logic, algebra, and the theory of computation to the existing faculty (Professor Clark, Professor Liang, and myself); (3) reorganized and expanded the existing offering in the foundations of mathematics and computation into a strong new program; and (4) publicized the program. Further support to the Theory of Computation program was achieved this spring when the Department approved Logic

and Foundations as one of the four main streams of graduate education in Mathematics (along with Analysis, Topology and Geometry, Differential Equations, Dynamics and Control, and Probability and Statistics). This supports the "Theory of Computation" program by moving its classes into the Department's mainstream.

Theory of Computation is growing rapidly in its importance to Mathematics and Computer Science, in marketability, and in graduate student interest. We have, over the last ten years, increased the size, strength and productivity of this program to the level of national visibility. We are working to coordinate our program with the Department of Computer Science. Our program now (Fall 1993) consists of seven faculty members and is the largest in the state.

VIII. GRANTS AND PROPOSALS:

A Computational Model of Distributed Information Processing in Non-neural Tissue, with J. Pedersen and Bruce Lindsey (College of Medicine); submitted to NSF April 1992.

A Mathematical and Experimental Approach to Understanding a New Biologically-Motivated Model of Distributed Computation, with J. Pedersen, G. McColm, R. Darling, Bruce Cochrane (Biology); submitted to NSF on 23 November 1990. Declined.

Mathematical Issues in Biologically-Motivated Computation – Sponsor an AMS Special Session; submitted to IBM on 3 December 1990. Awarded \$2,500.00.

1988-89

Research into Parallel and Distributed Computing, submitted with 10 other faculty members and Stark as the P.I. A proposal for the Department of Defense to grant \$349,000; submitted 30 September 1988. Declined.

Mathematical Sciences Research Equipment, a proposal that NSF help purchase \$76,000 worth of computing equipment. Submitted to NSF jointly with Drs. Ismail, McColm, Pedersen, Pothoven and Williams. Awarded.

1987-88

Programming Strategies for Neural Networks, a proposal for NSA currently (April 1988) being developed. The work will be conducted within the ICM. Declined.

Distributed Computation for Natural Signal Interpretation, (February 1988). This is a part of a proposal to NSF to establish a center of mathematical excellence at USF. Ed Saff (P.I.). Declined.

A Center for the Study of Computational Mathematics and Distributed Processes, (December 1987). Declined.

before 1985

Artificial Social Intelligence. Submitted for a USF Research and Creative Scholarship Grant. Funded for 1984 at \$3,000. Awarded.

Logical/algebraic foundations for reasoning mechanisms. Submitted (July 1983) to the U.S. Army Research Office for funding as a grant to USF, funded as contract DAAG 29-81-D0100. The contract phase is a mechanism for qualifying new researchers for the grant phase. Funded at the level of \$14,251 for the year beginning 14 March 1983. Awarded.

Design and Initial Development of the USF Patient/Physician Simulator. Funded by the Center for Mathematical Services (1981-82) at about \$6,000. Awarded

An Algebraic Approach to Context Understanding in Natural Language Understanding Systems. Submitted as a grant proposal (with an unofficial budget of \$500,000 per year) to the Office of Naval Research in July 1984, by Drs. Julius Tou (Univ. of Fla., P.I.), John Leonard and Stark. Declined.

The Florida teacher education program in computer and information science. A five-year program \$477,000 proposal submitted to NSF by Drs. Nagle, Flynn, Snader and Stark (P.I.) on 14 February 1984. Declined.

Algebraic foundations for artificial social intelligence. Submitted to NSF for three years of support in October 1983. Declined.

Individual behavior as the foundation for the dynamics of distributed processes. Submitted to NSF for \$39,383 of support in July 1980. Declined.

Member of the “Theory Net” grant proposal to NSF. Funded for USF in 1980 for two computer terminals and modems. Other funding covered long-distance telephone network charges for two years. About \$4,000 in support. Awarded.

A formal theory of individual behavior as the foundation for the dynamics of distributed systems. Submitted to NSF in 1979 for \$29,000. Declined.

The type structure of the University of Texas Automatic Theorem Prover. Submitted with Professor W.W. Bledsoe (P.I.). Awarded as NSF 2610180450 (1976).

IX. HONORS AND BIOGRAPHIES:

American Men and Women of Science, (1978, 1989, 1997)

The Omega-Group (biographies of mathematical logicians, since 1979)

The International Association for Cybernetics (1985)

Who's Who in Science and Engineering, (1989-97)

Who's Who in the South and Southwest, (1989-97)

Dictionary of International Biography, (1992)

Who's Who in America, (47th Edition, 1993--97)

USF Research Sabbatical Grant (1 semester at full pay) Fall 1994

Chair of Mathematics Department, starting August 1994

Invited speaker at AMS 80th Annual Convention, 1974 (in the Special Session on Set Theory).

X. PROFESSIONAL ORGANIZATIONS:

Sigma Xi

American Mathematical Society

Mathematical Association of America

Association for Computing Machinery (past member)

International Association for Cybernetics

American Academy for the Advancement of Science (past member)

New York Academy of Sciences (past member)

Union of Concerned Scientists (past member)

Association for Symbolic Logic (past member)

IEEE Computer Society (past member)

XI. EXTERNAL CONSULTING:

Analytical Geometry in the Design of a Virtual Reality Viewing Environment, for Sigma Engineering (Swiss) 1992.

Chapman & Hall Ltd., Scientific, Technical and Medical Publishers; technical/editorial consulting, 1991.

Consulting in mathematics and computer science for the U.S. Army, Fort Monmouth, New Jersey. Contract number DAAG29-81 (1984--85).

Consulting for John Wiley & Sons Publishers (Interscience and Journals Division) on LISP and Artificial Intelligence (1983-\$\ldots\$).

President and partner in Xanadu Computer Access, Inc. (1982--85).

XII. DEPARTMENT, COLLEGE, AND PROFESSIONAL SERVICE:

2008-2009

Course Development: I spend most of my time now in course development for MAT6932 BioInformatics and MAT5932 Symbolic Computation (in MAPLE). (1) Since there are no texts covering the mathematics used in bioinformatics, and since I am not a biologist, I am digesting original research papers, extracting the mathematics used (or misused), and guiding my class to discover the details. This takes a great deal of time. (2) I am developing a laboratory experience for symbolic computation in the form of a collection of one-week projects.

Creative Activity: A good deal of time goes into my Asynchronous Networks of Automata project, and in trying to get the corresponding monograph published by the best possible organization.

I have had some success in research in connection with the main ANA problem. In particular, I've finally been able to evaluate indefinite Lebesgue integrals (over the space of all non-deterministic runs of a non-deterministic computation, continuum many runs with a natural measure) which express expected halting time, expected Shannon entropy, etc. This was the subject of presentations made (by me and later by Dr. Apurva Bhatt) in our Discrete Mathematics Seminar. I have also had one contact with people extending my original work in this area with the US Army's Center for Command, Communication, and Control at Fort Monmouth, NJ [1978-83]. In this contact, I demonstrated my methods of program verification for asynchronous networks of communicating automata.

My publishing has boiled down to reviews for Computing Reviews (e.g., Computing Algebraic Functions with Biochemical Reactions [attached] and one other).

Graduate Students: I have graduate students working in my research area (in the development of algorithms for and mathematics for asynchronous networks of automata. Students include Arash Ardastani, Pedro Wightman Rojas, Dr. Daladier Jabba, Haiqiong Yao, and (potentially) Tony Long.

Committees and Miscellaneous Activities: I have served on various committees: (1) Departmental Advisory Committee, (2) Nagle Lecture Committee, (3) Department Publicity Committee, (4) College Computing Committee (substitute for Professor Ma). I am (5) Department contact with Moffitt Cancer Center (Dr. Willism S Dalton) in connection with computational problems relating to their bioinformatics research, and I judged for the (6) Graduate Student Research Symposium, Research One Symposium, Thursday 8 October. Other things have been forgotten.

My style of work does not fit easily into the standard (pre-tenure) academic format, so my CV has failed to keep up.

Review Number: 97178, 31 May 2009, W. Richard Stark, USF, Tampa

Computing algebraic functions with biochemical reaction networks

by H.J. Buisman, H.M.M. ten Eikelder, P.A.J. Hilbers, A.M.L. Liekens, all of Technische University Eindhoven

This is a valuable and very well written contribution to our understanding of biological information processing. The authors investigate (highly idealized) abstract biochemical reactions in which the chemical inputs and outputs determine the numerical inputs and outputs of functions.

A clear inductive presentation shows that reaction networks corresponding to algebraic functions can be constructed -- constants $k(x)=c$, multiplication $m(x,y)=x*y$, division $d(x,y)=x/y$, addition, subtraction, roots, powers, and the composition of functions. Independent variables have values which are the concentrations of reactants in a steady state.

Reaction coefficients determine function coefficients, and so are constant. The availability and temperature of reactants are assumed to be constant, and the possible accumulation of products is not considered. Undergraduate-level methods for differential equation are used to compute steady-state values.

For example: they show how a biochemical reaction could exist whose reactants, in stable concentrations a , b and c , produce an output in concentration d , where $0=a*d^2+b*d+c$. In other words, the quadratic formula is algebraic and, by the time the example is given, we know that algebraic functions can be computed!

Twenty years ago I had planned to do something like this; but my plan collapsed under the weight of reality, and a less than optimal strategy. The author's strategy is elegant and they have included just enough biochemical reality to make this a good starting point for further work. Unfortunately, I have read little of the work of others mentioned as references, so I am not able to spread credit as far and as fairly as I could have a decade ago. But I am sure that young researchers can find, in this paper, many interesting and important problems for further work.

Pre-2008

Course Development:

MAT 6932 Bioinformatics, 2002-2003.

MAT 5932 Complex (Information Processing) Systems – Theory and Models, 1996.

Perspectives in Modern Mathematics: Applications of the Imagination and of Personal Computers to High School Mathematics and Science (USF, Lakeland, 1989-\$\ldots\$).

MAD 3100 Applications-Oriented Algebra, 1983.

MAT 5932 Logic and Foundations, 1991.

MAT 5932 Mathematical Models for Parallel and Distributed Computing, 1988.

MAD 5101 LISP Programming With Algebraic Applications (offered yearly since 1979).

Neural Networks and Distributed Processing, offered 1987-88.

MAT 5932 Mathematical Logic and Foundations I (restructured 1991).

MAT 6507 Mathematical Logic and Foundations II (restructured 1991).

Course development Group Problem Solving in Mathematics and Science for secondary school teachers in 1988, '89, '90 at USF (Lakeland).

COP 4215 Mathematical Problem Solving Using PASCAL, 1985.

Refereeing for:

Mathematical Systems Theory (Editor: Professor S. Evan), 1997.

International Workshop for Information Processing in Cells and Tissues, at The University of Liverpool, September 1995, 1997.

ACM SIGBIO (Editor: Ray Paton, Univ. of Liverpool)

Academic Press (Elaine Wigzell)

Chapman & Hall (Dr. Susan King)

Information and Control (Editor of Information and Computation, Albert Meyer, MIT, 1980-98)

IEEE Computing Transactions (Editor: Oscar Garcia, USF)

IEEE Computer Society (Editor: Virgil Kilgore, Univ. of Maryland)

Journal of Intelligent Systems (Editor: M. McGuire of Wiley)

International Journal of Computer and Information Science (Editor: Julius Tou, Univ. of Florida)

Reviewing regularly since 1979 for:

Mathematical Reviews and Computing Reviews. See Section V.

Judging:

I served as a Main Event Judge at the \ul{42nd International Science and Engineering Fair} (Orlando, 5-10 May 1991). I expect to continue to work with the Science Service on this fair in future years in other states.

Professional reviewing:

I served as a reviewer for the Chinese University of Hong Kong of three candidates for promotion to full professor, February 1998.

XIII. GRADUATE STUDENTS:

Doctoral Students (1987-...):

I am/was a member of the Ph.D. Committees of:

Wes Skinner (Mathematics)

Nabeil Al-Madana (Computer Science)

Raghn Sastry (Computer Science)

Ruiming Zhang (Mathematics)

Paulo Bobreck (Computer Science)

Joo Young-do (Computer Science)

Wayne Pollack (Computer Science)

Alok Chaturvedi (Computer Science)

Margaret Yoder (Mathematics)

Tony Chang (Mathematics)

Yun-Sik Lee (Computer Science)

Doctoral Students Before 1991 (Member of Committee):

I was on the Ph.D. Committee of each of these students:

Qing Zhao (Mathematics)

Gongyuan Yao (Mathematics)

Cindy Sarmento (Computer Science)

John McNally (Computer Science)

Amir Abou-El-Naga (Computer Science)

Paul Higgins (Mathematics)

Kim Moon (Computer Science)

Ron Vogelsong (Engineering)

Seung Yang (Computer Science)

Jae You (Computer Science)

Charles Wells (Computer Science)

Master's Degree Students in Mathematics:

Wes Skinner (1991)

Tina Tremmel (1991)

David Devine (1989)

Gabor Belovari (1984)

Kevin Schweiker

Ruth Guthrie

Stephen Pettit

Theodore Netterfield

Rajiv Dholakia

Kurt Long

Master's Degree Students in other departments:

Adam Williams (Biology) (1998-99)