

TECHNICAL ELECTIVES

The "technical" electives must be a coherent, related set of courses - they should "hang together" in some way. (However, they do NOT have to be technical in the sense of being hard or scientific or mathematic in nature!) They should be approved by your advisor, who will sign your curriculum guide form after you list the technical electives. They can be all elective computer science courses or they can include courses from related departments (most commonly business, engineering, math and statistics). Sample groups of "technical" elective courses are listed below. Remember, these are just suggestions. You can put together your own technical electives.

Some students plan a strong "minor" area or even a dual major with some other department. Career opportunities are generally favorable for an individual who is knowledgeable in some application field and who can deal with the use of computers in that field.

On the other hand, if you intend to work with computer systems as opposed to applications, you should take several of the core computer science electives. (These are also the core of our MS program.) A strong program of computer science electives will put you in excellent stead for either a career or advance graduate work.

An elementary probability/statistics course is not required, but it is highly recommended for almost any program.

If you intend to do graduate study in computer science, you should take CS 670, Discrete Structures. For study at the PhD level, many schools require a reading knowledge of at least one foreign language. However, K-State does not have this requirement.

AREAS OF TECHNICAL ELECTIVES: (EXAMPLES)

1. Business Electives

286 306 Operating Systems Laboratory

286 662 Business Data Processing (COBOL II)

286 765 EDP Systems Analysis

305 260 Fundamentals of Accounting

305 270 Managerial Cost Controls

(or any course required for a BS in Business)

2. Computer Software Electives (also the core of the MS program)

286 740 Introduction to Software Engineering

286 700 Translator Design I

286 720 Operating Systems II

286 760 Information Organization and Retrieval

3. Scientific Computing Electives

245 222 Analytic Geometry and Calculus III

245 240 Series and Differential Equations

286 780 Numerical Solution of Ordinary Differential Equations

286 785 Numerical Solution of Partial Differential Equations

550 571 Introduction to Operations Research II

286 710 Computer Simulation Experiments

4. Mini/Micro Computer Systems

286 658 Microcomputer Programming and Applications

286 750 Computer Architecture Experiments

EE 641 Design of Digital Systems

EE 643 Computer Logic Laboratory

5. Other Areas for Technical Elective Courses

- dual degree with Electrical Engineering
- dual degree with Business
- dual degree with Mathematics

6. Miscellaneous Computer Science Electives

(These do not constitute a "coherent" set of technical electives, but they can be combined with electives from other areas.)

- 286 670 Discrete Computational Structures (recommended for persons entering graduate studies in Computer Science)
- 286 690 Implementation Projects (special projects by arrangement with some faculty member)
- 286 710 Computer Simulation
- 286 725 Computer Networks
- 286 736 Computer Graphics
- 286 735 Artificial Intelligence

PAUL S. FISHER

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Education:

1963	BA	Mathematics	University of Utah
1964	MA	Mathematics	University of Utah
1969	PhD	Computer Science	Arizona State University

Teaching and Interests:

Languages and Language Implementation
 Data Base Management System
 Computer Architecture
 Distributed Processing
 Networking
 Distributed Data Base Management Systems
 Special Purpose--Functional Architecture
 Automatic Generation of Data Base Systems and Application Software

Grants:

1. NSF Regional Conference 1970
2. Applicability of the Extensible Programming System (EPS) to General Software Problems 1975
3. Research into and Development of a Low Cost Hardware Monitor 1974-1975
4. Hardware Error Detection and Fault Isolation by Software 1974-1975
5. Reliable Software Workshop 1974-1975
6. Back-end Mini-Computers: Usability and Feasibility 1974-1975
7. Portability Issues for Mini-Computers using IDMS, A Data Base Management System 1975
8. Heterogeneous Mini-Computer Network with Distributed Data Base Resources 1976-1977
9. Software Portability Issues 1976-1977
10. Investigation of Mini Networks 1978
11. Communication Techniques 1976
12. A Back-end DBMS Communication System 1976-1977
13. Data, Its Internal and External Form 1976-1977
14. A Network Processing System 1978
15. Automatic Generation of Data Base System 1980
16. Full Screen Editor: An Experiment in Machine Independent Software 1981

Publications (papers and reports):

Fisher, P. S., "A Mini Operating System," ACM-SIGPLAN Symposium, Pedagogic Languages with Small Computers, January 6-7, 1972.

McDonough, V., P. S. Fisher, R. Weinberg, "Use of Computer Simulation for Designing a Dual-Processing, Time-Sharing, Mini-Computer System," ACM-SIGPLAN Symposium, Pedagogic Languages with Small Computers, January 6-7, 1972.

Ahmed, N., P. S. Fisher, "Study of Algorithmic Properties of Chebyshev Coefficients," International Journal of Computer Mathematics, Vol. 2, 1970, pp. 307-317.

Ahmed, N., P. S. Fisher, R. R. Rao, "On a Criteria for Data Compression and Binary Fourier Representation," presented Midwest Symposium on Circuit Theory, May 7-8, 1970.

Fisher, P. S., E. E. Kohlbecker, "A Generalized Fibonacci Sequence," Fibonacci Quarterly, Vol. 10, 1972, pp. 337-344.

Skidmore, E. L., P. S. Fisher, N. P. Woodruff, "Wind Erosion Equation: Computer Solution and Application," Soil Science Society of America Proceedings, Vol. 34, No. 5, November-December 1975.

Fisher, P. S., W. J. Hankley, V. E. Wallentine, "Separation of Introductory Programming and Language Instruction," 4th ACM-SIGCSE Annual Conference, February 1973.

Cassing, D., P. S. Fisher, R. Janes, "A Software Virtual Memory System for a Mini-Computer," Second Annual Computer Conference, Austin, Texas, November 1973.

Fisher, P. S., "Virtual Memory: A New Horizon for Mini Computers," 9th IEEE Computer Society International Conference, Washington, D. C., September 1974.

Hankley, W., P. S. Fisher, "A Vertical Assertion Facility," Third Annual Computer Conference, Austin, Texas, November 1974.

Maryanski, F. J., P. S. Fisher, "A Mini Computer Distributed Data Base Management System," NBS-IEEE Trends and Applications Symposium: Micro and Mini Systems, May 1976, pp. 113-117.

Maryanski, F. J., P. S. Fisher, and V. E. Wallentine, "Evaluation of Conversion to a Back-End DBMS, ACM National Conference, October 1976, pp. 293-297.

Maryanski, F. J., P. S. Fisher, "Rollback and Recovery in Distributed Data Base Management Systems," Proc. ACM Annual Conference, October 1977.

Maryanski, F. J., P. S. Fisher, V. E. Wallentine, M. A. Calhoun, "Distributed Data Base Management Using Mini Computers," INFOTECH State of the Art Report Minis Versus Main Frames, 1978.

Slonim, J., P. S. Fisher, "Survey of Mini Data Base Management System in 1977," Proceedings First Symposium on Small Systems, ACM, New York, August 1978.

Slonim, J., E. A. Unger, P. S. Fisher, "Data Base Management System Environments Present and Future," ACM SIGSMALL 79 Second Annual Symposium on Small Systems, October 1979, Dallas, TX.

Maryanski, F. J., P. S. Fisher, R. Housh, D. Schmidt, "A Prototype Distributed DBMS," Proceedings of 12th Hawaii International Conference in Systems Sciences, January 1979.

Fisher, P. S., J. Slonim, D. A. Schmidt, "Consideration for Determining the Degree of Centralization or De-centralization in the Computing Environment," Information and Management, Vol. 2, No. 1, February 1979.

Maryanski, F. J., P. S. Fisher, V. E. Wallentine, "Data Access in Distributed Data Base Management Systems," Information and Management, Vol. 2, No. 6, December 1979.

Su, S. Y. W., H. Chang, G. Copeland, P. S. Fisher, E. Lowenthal, S. Shuster, "Data Base Machines and Some Issues on DBMS Standards," Proceedings NCC, Vol. 49, May 1980, also published in Tutorial: Data Base Management in the 80's, J. A. Larson, H. A. Freeman, IEEE Publishers, 1981.

Fisher, P. S., J. Slonim, "Software Engineering: An Example of Misuse," Software Practice and Experience. Vol. II, No. 6, June 1981.

Fisher, P. S., P. Hollist, J. Slonim, "A Design Methodology for Distributed Data Bases," Proceedings IEEE COMPCON 80, Washington D.C., September 1980.

Slonim, J., D. Copeland, L. MacRae, P. S. Fisher, "Information in Medicine: Past, Present and Future," Proceedings Fourteenth Annual Hawaii Conference on Systems Sciences, January 1981.

Fisher, P. S., J. Slonim, "Enterprise Structure as Influenced by Hardware Topology," Proceedings MIMI'AD1, Mexico, May 1981.

Jacob Slonim, F. J. Maryanski, P. S. Fisher, and L. J. Macrae, "Sequential vs. Concurrent Processing: A Throughput Model," Information Systems, Vol. 6, No. 4, December 1981.

Case, J., P. S. Fisher, "Factoring F.I. Sequences," submitted for publication.

Fisher, P. S., I. Marschik, "Biometrics: A Support Tool to Measure Human Factors in System Development and Operations," Proceedings Second Symposium on Microcomputer and Microprocessor Applications, Budapest, Hungary, Oct. 6, 1981.

Butler, E., P. S. Fisher, "Computers and Data: The Hospital Information System," Proceedings Fifteenth Annual Hawaii Conference on Systems Sciences, January 1982.

Fisher, P. S., "A Data Base Design Technique For Centralized or Distributed Topologies", Computer Communications to appear in 1982.

Han, M. J., P. S. Fisher, "The Problem of Data Structure on a Heterogeneous Environment", Advances in Distributed Data Base Systems Management, Vol. II., Heyden Publishing Co., 1981.

Slonim, J., R. A. McBride, P. S. Fisher, E. A. Unger, "A Quantitative Analysis of Information Processing in Centralized and Distributed Architectures", Advances in Distributed Processing, Vol. II, Heyden Publishing Co., 1982.

Unger, E., P. Fisher, J. Slonim, "Evolving to Distributed Database Environments," Computer Communications, Vol. 5, No. 1, February 1982.

Research Interests:

There are two problems in which I am presently interested. The problems deal with movement and utilization of information and the understanding of that information. In the first case, I am working with information in the distributed environments. The objective is to develop a procedure which permits the movement of systems in a family of possible environments. For example, a data base consists of data of three essential forms: modifiable, non-modifiable, and derivable. Clearly, every data base must contain all modifiable and non-modifiable data. However, the inclusion of derivable data is optional. This type of data then comprises a range or family of equivalent data bases, and I am developing a framework for moving the data base and the corresponding applications over this range in an automatic fashion.

The second problem is, as indicated, dealing with understanding information. For example, a typewriter which types from verbal input is a case in point. This area borders upon AI, mathematics and information processing. We are well along into this area using a mathematical framework for describing such problems. It is called a pre-algebra for finitely inductive sequences. This class of sequences can be used to describe all regular phenomena. The typewriter is such a phenomenon.

Both of these areas are couched in larger areas of interest, especially the data base problem. Hence, I am interested in problems in several distributed processing and data bases, especially those with irregular internal structures, such as text data bases, networks, communication and associated languages for such systems.

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Education:

1962	BS	Electrical Engineering	Northwestern Univ.
1964	MS	EE (Information Science)	Northwestern Univ.
1967	PhD	EE (Computer Science)	Ohio State Univ.

Teaching and Interests:

Programming languages
 Compiler design
 Software engineering
 Computer graphics
 Operating systems
 Semantics of languages
 Real-time software

Publications (papers and reports):

(* denotes document report for funded project)

W. Hankley, J. Tou, "Note on Control of Multiple Input Discrete Systems", IEEE Transactions on Automatic Control, Vol. AC-12,4, August 1967, pp. 469-470.

W. Hankley, J. Tou, "Automatic Fingerprint Interpretation and Classification via Contextual Analysis and Topological Coding", in Pictorial Pattern Recognition, Thompson Book Co., Washington, D.C., 1968, pp. 411-456.

W. Hankley, "Fingerprint Classification for Automated Processing", Proceedings, Carnahan Conference on Electronic Crime Countermeasures, Univ. Kentucky, 1968, pp. 70-82. Also presented at 1968 WESCON.

W. Hankley, H. Merrill, "A Pattern Recognition Technique for System Error Analysis", IEEE Transactions on Reliability, Special Issue Vol. R20, 3, August 1971, pp. 148-153.

P. Abergglen, W. Faris, W. Hankley, "Design of a Real-Time Central Data Acquisition and Analysis System", Proceedings of the IEEE, Special Issue, Vol. 58, 1, January 1970, pp. 38-48. Reprinted in J. Schoeffler, R. Temple (Eds), Minicomputers: Hardware, Software, and Applications, IEEE Press, New York, 1972.

W. Hankley, N. Miller, "Characterization of Pulse Waveforms for Classification", (Abstract) IEEE Symposium on Feature Extraction and Selection, New York, 1971.

F. Templeton, W. Hankley, "Dynamic Control of a Process with Discrete and Continuous Decision Variables", in Techniques for Decision Making in the Mineral Industry, Canadian Institute of Mining and Metallurgy, Montreal, Quebec, 1971.

T. Carey, W. Hankley, "Empirical Modeling of Occurrences of Severe Weather Events", Proceedings, Conference on Environmental Engineering, Society of Engineering Science, Washington, D.C., 1971, pp. 83-108.

P. Fisher, W. Hankley, V. Wallentine, "Separation of Introductory Programming and Language Instruction", ACM SIGSCE Bulletin, Vol. 5, 1, February 1973.

W. Hankley, V. Wallentine, "Programming Language Design for a Spectrum of Users", Proceedings 7th Annual Conference on the Interface of Computer Science and Statistics, Iowa State University, October 1973.

W. Hankley, P. Fisher, "Top Down Refinement of Assertions", Proceedings Third Texas Conference on Computing Systems, November, 1974.

W. Hankley, V. Wallentine, "Color Graphics for Remote Teaching", Proceeding 1980 SIGGRAPH Conference SIGGRAPH, Vol. 14, 3, 1980.

W. Hankley, "Language Structure for Reusable Software", submitted to Communications of the ACM, submitted November 1980.

W. Hankley, V. Wallentine, "Discrete Simulation with a Concurrent Language Base", Proceedings 1981 Summer Computer Simulation Conference, July 1981, pp. 12.

V. Wallentine, W. Hankley, "Modeling and Simulation of the Performance of Distributed Data Management Systems", in P. Fisher, E. Unger (Editors), Advances in Distributed Process Management, Haydon and Sons, 1981, pp. 39.

W. Hankley, G. Lyon, M. Zelkowitz, "Representation of Programs for Interactive Development", in preparation 1981-82.

All available from Computer Science Department, Kansas State University, Manhattan, KS 66506, except as noted.

*W. Hankley, "Source-Environment Models for SO2 Concentration", Kennecott Copper Corp., Salt Lake City, Utah, 1971.

G. Anderson, W. Hankley, Users Guide, Computer Science Graphics Package, 100 pp., 1974. (Used as class reference.)

*CS 75-01, P. Fisher, W. Hankley, J. McCall, Steps Toward Reliable Software: Proceedings of a Workshop, 90 pp., January 1975.

*CS 75-02, J. Carrow, P. Fisher, W. Hankley, J. McCall, Steps Toward Reliable Software: A Workshop on Structured Programming, Proceedings of a Workshop, 147 pp., February 1975.

*CS 75-03, I. Sagie, A. Gonen, W. Hankley, EPS II -- An Extension of ML/I: Users Primer and Guide to Applications, 115 pp., July 1975.

CS 76-18, W. Hankley, J. Rawlinson, Sequential PASCAL Supplement for FORTRAN Programmers: A Primer of Slides, 161 pp., December 1976.

*W. Hankley, Design of the MIMICS Message System, 98 pp., 1977.

*CS 77-01, V. Wallentine, W. Hankley, G. Anderson, M. Calhoun, F. Maryanski, Progress Report on Functionally Distributed Computer Systems Development: Software and Systems Structure, 142 pp., December 1976.

CS 77-12, P. Fisher, W. Hankley, F. Maryanski, Porting Software to Multiple Minis: A DBMS Case Study, 23, pp., December 1976.

D. Snyder, W. Hankley, Conversion of the Computer Science Graphics Package to PASCAL, 75 pp., 1977. (Used as class reference.)

*CS 79-05, V. Wallentine, W. Hankley, R. McBride, SIMMON -- A Concurrent Pascal Based Simulation System, 52 pp., 1979.

*CS 79-02, W. Hankley, V. Wallentine, A. Skidmore, NEISIM -- Network Simulation System, 50 pp., 1979.

Current Research Interests:

Work on interactive systems for personal computers, including:

- development of a personal computing system for Chinese children using phonetic characters as the keying system.
- design of a portable "graphics-structured-Basic-like" language for personal computer with character graphics, pixel graphics, and moving object graphics (like sprites or player/missiles).
- development of instructional games for programming concepts compatible with PASCAL (somewhat like Karel the robot, but less robot and more gamelike).
- study of future architectures for personal computers, particularly the use of multiple processor for control of concurrent interactive activities.

Future Research Interests (joint with D. Gustafson):

We are studying possible future generations of software development systems. Such systems would be in the form of interactive user-friendly tools which provide aid for creation of programs. Potential keys for creation of programs include reuse of existing modules, specifications using assertions which are more descriptive than the current type information, using patterns from previous

programs, and at least partial creation of programs from specifications of input and output data structures. Initially, we are viewing such operations in the context of "smart" editing environment.

DR. ELIZABETH A. UNGER

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Education:

1961	B.S.	Mechanical Engineering	Michigan State Univ.
1963	M.S.	Mathematics	Michigan State Univ.
1978	Ph.D.	Computer Science	University of Kansas

Teaching and Interests:

1. Research Interests
 - a) Programming Languages
 - b) Information Retrieval Systems of Behavioral Science
 - c) Computer Libraries
2. Courses Taught
 - a) Data Base Management at B.S., M.S. and Ph.D. levels
 - b) Programming Languages at B.S. and Ph.D. levels
 - c) Computational Structures at Ph.D. level
 - d) Data Structures at B.S. level
 - e) Introductory Computer Science and Computer Literacy
 - f) Distributed Systems at M.S. and Ph.D. levels
 - g) Computing Service Center Management at M.S. level
 - h) Numerical Analysis at B.S. level

Publications (papers and reports):

Cipra, L. E., E. A. Unger, O. W. Bidwell, "A Computer Program to 'Key-out' World Soils," Soil Science, September 1969.

Danskin, D. G., E. A. Unger, C. E. Kennedy, "Adapting the Computer for Narrative Material: A progress Report," Journal of Counseling Psychology, 17, pp. 63-66, 1970.

Unger, E. A., T. J. Swanson, M. H. Miller, "Planning for the Expansion of Computing Capabilities," 3rd Texas Conference on Computer Systems, Austin, Texas, 1974.

Unger, E. A., N. Ahmed, "An Instructionally Acceptable Cost Effective Approach to a General Introductory Computer Science Course," Bulletin of the ACM Special Interest Group in Computer Science Education, May 1976.

Sego, J., E. A. Unger, "The Computer to Your Rescue," Journal of Home Economics, September 1977.

Schweppe, E. J., E. A. Unger, "A CONCURRENT MODEL: Fundamental," Proceedings 1st European Conference on Parallel and Distributed Systems, February 1979.

Slonim, J., E. A. Unger, P. S. Fisher, "Data Base Management System Environment Present and Future," ACM Sigsmall, 1979.

Unger, E. A., R. A. McBride, J. Slonim, F. J. Maryanski, "Design for the Integration of a DBMS into a Network Environment," in Proceedings of Sixth Data Communications Symposium, IEEE, 1979.

Maryanski, F. J., E. A. Unger, "A Major in Information Systems," Special Issue on Computer Systems Education, IEEE, 1979.

Unger, E. A., P. S. Fisher, R. A. McBride, J. Slonim, "Design for Integration of a DBMS into a Network Environment," Computer Society Tutorial on Distributed Processing, IEEE, March 1980.

Unger, E. A., E. J. Schweppe, "A Concurrency Method: Definition," Proceedings of ACM Computer Science Conference, Feb. 1981.

Schweppe, E. J., E. A. Unger, "A Concurrency Method: Examples," Proceedings of ACM Computer Science Conference, Feb. 1981.

Unger, E. A., P. S. Fisher, "Evolving to Distributed Data Base Environments," Computer Communications, Vol. 5, No. 1, 1982.

Engler, Verlyn, E. A. Unger, and Bryan Schurle, "The Potential for Microcomputer Use in Agriculture," Kansas Agricultural Experiment Station, Contribution member 81-412-A (also presented to the Agricultural Economics Annual Meeting, August 1981).

Unger, E. A., W. T. Cottrell, P. A. Viglicci, "Management Issues on a Geographically Distributed Network," in Advances in Distributed Processing, Vol. 2, Heyden Pub. Co., 1983.

Slonim, J., R. A. McBride, P. S. Fisher, E. A. Unger, "A Throughput Model," in Advances in Distributed Processing, Vol. 2, Heyden Pub. Co., 1983.

McBride, R. A., J. Slonim, L. J. MacRae, E. A. Unger, "Mediator: An Approach for Providing a Global User View in a Distributed Information Environment", in Advances in Distributed Processing Management, Vol. 2, Heyden Pub. Co., 1983.

Aikens, W. A., E. A. Unger, "System Resiliency in a Mobile Network", in Advances in Distributed Processing Management, Vol. 2, Heyden Pub. Co., 1983.

Mata Toledo, R. A., E. A. Unger, "Another Look at Motivating Data Processing Professionals", (submitted to Datamation, Oct. 1982).

Fox, Richard A., E. A. Unger, "Selecting a Database Management System," in Advances in Database Management, Vol. 2, Heyden Publishing Company, 1983.

Slonim, J., R. A. McBride, P. S. Fisher, E. A. Unger, "A Quantitative Analysis of Information Processing in Centralized and Distributed Architectures," in Advances in Distributed Processing, Vol. 2, Heyden Publishing Company, 1983.

Slonim, J., L. J. MacRae, E. A. Unger, "Distributed System Development: Risks and Rewards," Auerbach Series on Computer Systems, 1982.

Barker, R. and E. A. Unger, "A Predictor for Success in an Introductory Programming Class Based Upon Abstract Reasoning Development," (accepted for 1983 ACM/SIGCSE).

Research Interests:

The focus of all my research is distributed systems and the potential of operations that can be expressed within those systems. Currently, there are three active areas of research which are all interconnected.

1. The development of a model for the description of information within a computer environment. This model is called an object. The study of the properties of the data and the development of a calculus to manipulate and build new objects is the objective of this effort.
2. The use of the object in a language to allow the expression of concurrency without explicit action by the programmer. The language model exists and it is used to express office procedures in a current research project.
3. The use of the concept of an object (simplified) from the focus number one above, to implement a dynamic active data dictionary is the third area. An active dynamic dictionary has the advantage of making the physical structure and data completely invisible to user application programs. Currently, we can do this statically, but often programs must be recompiled for even minor changes in data storage or data constraints. Theoretically, this would allow two things: a) complete freedom of the DBA to change the data base and DBMS, and b) the integration of heterogeneous data base systems within a distributed environment.

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Education:

1965	BS	Mathematics	Iowa State University
1970	MS	Computer Science	Iowa State University
1972	PhD	Computer Science	Iowa State University

Teaching and Interests:

Operating Systems
 Programming Languages
 Computer Networks
 Software Engineering
 High-Level Language Architecture
 Office Automation

Grants (Funded):

1976 -
 1977 V. E. Wallentine, Principal Investigator. Functionally Distributed Computer Systems Software and System Structure (\$190,000). Grantor: U.S. Army Research Office

1977 V. E. Wallentine, Principal Investigator. Optimizing (Sequential and Concurrent) PASCAL Compilers for a High-level Language (HLL) Machine (\$15,700). Grantor: Advanced Development Division, Perkin-Elmer Data Systems

1977 V. E. Wallentine, Principal Investigator. A Systems Implementation Language for an HLL Architecture (\$30,000). Grantor: Advanced Development Division, Perkin-Elmer Data Systems

1977 V. E. Wallentine and W. J. Hankley, Principal Investigators. Simulation of Network Performance for Distributed Data Base Configurations (\$8,196). NCR Corporation

1978 V. E. Wallentine, Principal Investigator. A Network Based Operating System (\$38,000). Grantor: Advanced Development Division Perkin-Elmer Data Systems

1978 -
 1980 V. E. Wallentine, Principal Investigator. Distributed Operating Systems (\$265,000). Grantor: Army Research Office

1979 V. E. Wallentine, Principal Investigator. NSF Travel Grant (\$3,600)

1980 - V. E. Wallentine, Principal Investigator. Performance of Message-Based Operating Systems (\$8,300). Grantor: Perkin-Elmer Data Systems, Advanced Development Division.

1980 -

1981 V. E. Wallentine, Principal Investigator. Multi-level Symbolic Debugging in Separately Compiled Pascal Modules (\$40,000). Perkin-Elmer Ltd., Slough, England.

← 1983 V. E. Wallentine, Principal Investigator. Western Electric Graduate Program (\$166,000).

Equipment Grants:

1976 (\$190,000) with Paul S. Fisher and Fred J. Maryanski. Minicomputer equipment from Interdata

1977 (\$35,000) minicomputers, terminals, and communications interfaces from Perkin-Elmer Data Systems

1979 (\$50,000) minicomputer from NCR Corp. Wichita, Kansas

1980 (\$26,000) minicomputer memory from Perkin-Elmer Data Systems

Publications (papers and reports):

A Pedagogical Operating System, (with J. H. Campbell and C. T. Wright), ACM SIGPLAN Symposium on Pedagogic Languages with Small Computers, January 1972.

Separation of Introductory Programming and Language Instruction, (with P. S. Fisher and W. J. Hankley), Proceedings of ACM SIGCSE Annual Conference, February 1973.

Operating Systems in the Process Control Environments, (with F. R. Keller), Proceedings of Second Texas Conference on Computing Systems, Austin, Texas, November 1973.

Design of a Spectrum of User-oriented Languages, (with W. J. Hankley), Proceedings of Seventh Annual Conference on the Interface of Computer Science and Statistics, Ames, Iowa, October 1973.

A Model for Extensible-Contractible Language Compilers, (with G. G. Anderson), Proceedings of the 1975 International Algol 68 Conference, Stillwater, Oklahoma, June 1975.

A Simulation Model of a Backend Data Base Management System, (with F. J. Maryanski), Proceedings 5th Annual Pittsburgh Modeling and Simulation Conference, Pittsburgh, Pennsylvania, March 1976.

Evaluation of Conversion to a Backend Data Base Management System, (with F. J. Maryanski and P. S. Fisher), Proceedings of 1976 National ACM Conference, Houston, Texas, October 1976.

A Mini-Computer Based Distributed Data Base System, (with F. J. Maryanski, P. S. Fisher, M. A. Calhoun, and L. Sernovitz), Proceedings NBS-IEEE Trends and Applications Conference--Mini- and Micro-computer Systems, Washington, D. C., June 1976.

Distributed Data Base Management Using Mini-computers, (with F. J. Maryanski, P. S. Fisher, and M. A. Calhoun), Infotech State-of-the-Art Report, "Mini's Versus Mainframes," February 1978.

Experiences with the Portability of Concurrent Pascal, (with D. Neal), Software Practice and Experience, Vol. 8, No. 3 (May-June) 1978.

A Distributed Data Processing System Architecture, (with P. Fisher), (invited paper), Proceedings of SHARE 50, March 6-10, 1978, Denver, Colorado.

Programming Issues in Distributed Systems. Proceedings of the Network IPC Workshop, Georgia Tech., Phil Enslowe, editor, December 1979.

Experience with Concurrent Pascal as an Implementation Language, Proceedings of Conference on Microprocessors in DoD, Colorado State Univ., August 1979.

Data Access in Distributed Data Base Management Systems, (with F. J. Maryanski and P. Fisher), Journal of Information and Management, Vol. 2, No. 6 (December) 1979.

Editor (with W. Bulgren), Proceedings of the Eleventh ACM SIGCSE Technical Symposium, February 1980.

Color Graphics for Remote Teaching, (with W. J. Hankley), Proceedings of the 1980 ACM SIGGRAPH Conference, July 1980.

Computer Network Security, (with J. Scharf and P. Fisher), in Advances in Computer Network Security, Heyden & Sons, Philadelphia, PA, 1980.

Modeling and Simulation of the Performance of Distributed Data Management Systems, (with W. J. Hankley), in Advances in Distributed Processing Management, Paul S. Fisher and Elizabeth Unger, editors, Heyden & Son, Inc., 1981.

Discrete Simulation with a Concurrent Base Language, (with W. J. Hankley and R. A. McBride), Proceedings of 1981 Summer Simulation Conference, Reston, Va., July, 1981.

OFFICE/NET: The Backbone of the Automated Office (with J. Slonim, P. Fisher, L. McRae and R. McBride), in Electronic Office; Management and Technology, Auerbach Publishers, Inc., Pennsauken, N.J., April 1982.

An Abstract Machine to Control the Execution of Semi-Independent Concurrent Computations, (with C. T. Wright and R. F. Keller), (Iowa State University), U. S. Atomic Energy Commission Report IS-2920, August 1972.

A User-orientated Hardware Monitor, (with G. G. Anderson, F. R. Keller, and P. S. Fisher), KSU Department of Computer Science Technical Report, July 1975.

Usability and Feasibility of Backend Minicomputers, (with F. J. Maryanski and P. S. Fisher), KSU Department of Computer Science Technical Report, June 1975.

Implementation of a Backend Data Base Management System, (with F. J. Maryanski, P. S. Fisher, et al.), KSU Department of Computer Science, October 1975.

Concurrent PASCAL--A Tutorial, (with R. McBride), KSU Department of Computer Science, Technical Report No. CS76-17, December 1976.

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