

Illinois Institute of Technology

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NOTICE OF PROPOSAL SUBMISSION

TITLE: What Balance Between Technical Standards, and Professional Education?

AGENCY: NSF

DATE SUBMITTED: February 23, 1995

PRINCIPAL INVESTIGATOR: Dr. Vivian Weil

CO-PRINCIPAL INVESTIGATORS: Dr. Ilene Burnstein  
Dr. Michael Davis  
Dr. Bogdan Korel  
Dr. Ullica Segerstrale

Enclosed please find a copy for your records.

Distribution: Dr. Robert Carlson  
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Dr. Bogdan Korel  
Dr. Ullica Segerstrale  
Dr. Vivian Weil

# REQUEST FOR REVIEW AND APPROVAL OF PROPOSAL

PI/PD: V. Weil  
 Department: QSER  
 Proposal Title: On the use of...

Receipt Deadline: 3/1/93  
 Postmark Deadline: 1/1/93  
 Sponsor:   
 Proposal No:

PROGRAM TYPE	STATUS	COMPLIANCE REQUIRED	INFORMATION SOURCE
<input checked="" type="checkbox"/> Basic Research	<input checked="" type="checkbox"/> New	<input type="checkbox"/> Human subject	<input type="checkbox"/> IRB (IRB #)
<input type="checkbox"/> Applied Research	<input type="checkbox"/> Renewal	<input type="checkbox"/> Animal	<input type="checkbox"/> IACUP (IACUP #)
<input type="checkbox"/> Training	<input type="checkbox"/> Continuation	<input type="checkbox"/> Recombinant DNA	<input type="checkbox"/> Institutional
<input type="checkbox"/> Fellowship	<input type="checkbox"/> Supplement	<input type="checkbox"/> Biohazardous material	<input type="checkbox"/> Federal Register
<input type="checkbox"/> Instruction	<input type="checkbox"/> Other	<input type="checkbox"/> Radioactive substances	<input type="checkbox"/> Other
<input type="checkbox"/> Other			

AWARD INSTRUMENT	EXCEPTIONAL PROVISIONS	EXPLANATION OF EXCEPTION
<input type="checkbox"/> Grant	<input type="checkbox"/> Indirect costs (55% max)	
<input type="checkbox"/> Contract	<input type="checkbox"/> Early research	
<input type="checkbox"/> Cooperative Agreement	<input type="checkbox"/> Early equipment (no more than 10% of total)	
	<input type="checkbox"/> PI not supported	
<b>BUDGET DETAILS</b>	<input type="checkbox"/> Computer time required (if not included)	
Duration: <u>1/93-1/94</u>	<input type="checkbox"/> Faculty academic year	
Total requested: <u>\$10,000</u>	<input type="checkbox"/> Salary not budgeted	
1st year: <u>\$10,000</u>		
Budget: <u>\$10,000</u>		

## ENDORSEMENTS

Chairman	<input type="checkbox"/> Approved <input type="checkbox"/> Not approved <input type="checkbox"/> Approved, subject to	Date: <u>1/1/93</u>
Dean/Director	<input type="checkbox"/> Approved <input type="checkbox"/> Not approved <input type="checkbox"/> Approved, subject to	Date: <u></u>
Development Office	<input type="checkbox"/> Approved <input type="checkbox"/> Not approved <input type="checkbox"/> Approved, subject to	Date: <u></u>
Research Administration	<input type="checkbox"/> Approved <input type="checkbox"/> Not approved <input type="checkbox"/> Approved, subject to	Date: <u></u>
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Science. Technology & Society (EVS Studies)				NSF PROPOSAL NUMBER	
PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE					
Small Grants for Exploratory Research					
DATE RECEIVED		NUMBER of COPIES		DIVISION ASSIGNED	
				FUND CODE	
				FILE LOC	
EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)		SHOW PREVIOUS AWARD NO. IF THIS IS O A RENEWAL OR O AN ACCOMPLISHMENT BASED RENEWAL		IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES - NO _X_ IF YES< LIST ACRONYM(S)	
362170136					
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Illinois Institute of Technology			3300 South Federal Street		
AWARDEE ORGANIZATION CODE (IF KNOWN) :			Chicago, II. 60616		
0016915000					
NAME OF PERFORMING ORGANIZATION. IF DIFFERENT FROM ABOVE			ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT. INCLUDING DP CODE		
PERFORMING ORGANIZATION CODE (IF KNOWN) :					
IS AWARD-EE ORGANIZATION (Check All That Apply): O FOR PROFIT O SMALL BUSINESS O MINORITY BUSINESS O WOMAN-OWNED BUSINESS (Set GPG For Definitions) ORGANIZATION					
TITLE OF PROPOSED PROJECT					
What Balance Between Technical Standards. Professional Standards, and professional Education					
REQUESTED AMOUNT		PROPOSED DURATION (1-to MONTHS)		REQUESTED STARTING DATE:	
\$ 46.059 1		12 months		03 15 1995	
CHECK APPROPRIATE BOXES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW:					
O VERTEBRATE ANIMALS O NATIONAL ENVIRONMENTAL POLICY ACT O FACILITATION FOR SCIENTISTS/ENGINEERS WITH DISABILITY					
O HUMAN SUBJECTS O PROPRIETARY AND PRIVILEGED INFORMATION O RESEARCH OPPORTUNITY AWARD					
O HISTORICAL PLACES O DISCLOSURE OF LOBBYING ACTIVITIES O INTERNATIONAL COOPERATIVE ACTIVITY					
O BEGINNING INVESTIGATOR (see GPG SECTION C)					
O GROUP PROPOSAL					
O SMALL GRANT FOR EXPLORATORY RESEARCH H (SGER) (SEE GM SECTION U. C 12)					
PI/PO DEPARTMENT		PI/PO POSTAL ADDRESS			
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PI/PO FAX NUMBER		Chicago, IL 60616			
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Davis, Michael		378-40-3841	PhD, 1972	312/567-3017	
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CO-PI"					
CO-PI/PD					
NOTE: THE FULLY SIGNED CERTIFICATION PAGE			MUST BE	SUBMITTED IMMEDIATELY FOLLOWING THIS COVER SHEET	

SUBMISSION OF SOCIAL SECURITY NUMBERS IS VOLUNTARY AND WILL NOT AFFECT THE ORGANIZATION'S ELIGIBILITY FOR AN AWARD. HOWEVER THEY ARE AN INTEGRAL PART OF THE NSF INFORMATION SYSTEM AND TO ASSIST IN PROCESSING THE PROPOSAL, SSN SOLICITED UNDER NSF ACT OF 1950, AS AMENDED.

## PROJECT SUMMARY

TM Project Summary should include a statement of objectives, methods to be employed, and the significance of the proposed activity to the advancement of knowledge or education. Avoid use of first person to complete this summary. DO NOT EXCEED ONE PAGE. (Some Programs may impose more limits.)

- The IEEE Computer Society and the Association for Computing Machinery have formed a Joint Steering Committee for the Establishment of Software Engineering as a Profession (SEEPP). Their Working Groups will soon begin deliberations on e-mad and are scheduled to complete their work before November, 1995. This project presents a rare opportunity to study a technical profession coming into being. We have formed a research group of three (two ethics specialists and a computer science specialist) to study the activity of the Working Group on Reliability and Safety. We envisage a larger project to follow. We propose to study the relationship between individual responsibility, technical standards, and professional ethics while joining in the Working Group's deliberations. We would produce two reports. One would be a research paper contributing to our understanding of professions. The other would be a report that should be useful to the Joint Committee in its work.

We will proceed by monitoring the e-mail of the Working Group, complementing that effort by telephone interview from time to time for further explanation, and participating in any teleconferences or face-to-face meetings. The research team will meet monthly to analyze the process as recorded in e-mad and learned from conversation. The project includes three consultants, a sociologist in science studies, an expert on software testing and debugging, and a lawyer versed in software liability issues. We will call upon them as needed for information or help in analyzing what we observe and for comments and suggestions on drafts of our reports.

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'Proposers may select any numbering mechanism for the proposal.

## PROJECT DESCRIPTION

### WHAT BALANCE BETWEEN **TECHNICAL STANDARDS, PROFESSIONAL STANDARDS, AND PROFESSIONAL EDUCATION?**

Last year the IEEE Computer Society and the ACM--the world's two largest organizations of computing practitioners (combined membership of more than 175,000)--formed a Joint Steering Committee for the Establishment of Software Engineering as a Profession. In so doing, they created an opportunity to study a profession coming into being--and, given the size and importance of the organizations involved, an opportunity not likely to be repeated soon. They also created an opportunity for scholars concerned with professions to make their expertise available to members of a profession at a crucial moment. We propose to seize that opportunity before it is lost. We propose to study the relationship between individual responsibility, technical standards, and professional ethics while joining in the deliberations of one of the Joint Steering Committee's Working Groups. We would produce two reports. One would be a research paper contributing to our understanding of professions. The other would be a report that should be useful to the Joint Committee in its work. Our interdisciplinary research group brings together a range of skills ideal for what we propose.

The Joint Steering Committee established three task forces. One is to identify the body of knowledge and recommended practices that constitute the expertise of the new profession. A second is to define a curriculum for the training of members of the new profession (or, at least, set certain minimum educational standards). The third is to document and codify ethical and professional practices for members of the new profession. Each of these task forces is supposed to complete work by November 1995. Once the three report, they will be faced with the complex task of integrating ideas about what the technical knowledge of the profession is with what its professional and educational standards should be. What they decide may have substantial effects on who can engage in software development, what is expected of them, and what they have a right to expect of their employers. The Joint Committee will, in effect, be faced with a practical version of one of the deepest problems in the theory of professionalism, determining how much of professionalism is (or should be) adherence to technical standards, how much having the appropriate training, and how much maintaining ethical standards. We might illustrate the problem with an example. Bugs are a problem in

software. They can be a serious problem, especially when the software runs an important business function like check writing or a piece of equipment that can cause great harm if it works improperly. No complex software is free of bugs. Testing can remove most, but testing is expensive. How much testing is enough? There are at least three ways to answer this question.

One is organizational. A company might, for example, adopt the Cleanroom Process Model (CPM) where the goal is to produce software with very few defects by incremental development, formal specification languages, proofs of correctness, and statistically based independent testing. (Lidger, 1994) Few organizations have found this approach attractive. The Software Engineering Institute at Carnegie-Mellon has proposed another approach, the Capability Maturity Model (CMM). (Paulk et al., 1993) CMM attempts to improve software by increasing the "maturity" of the process. *CMM* has many levels. To reach the higher levels, an organization must commit considerable time and effort. CMM does not formally address testing at the lower levels, and few companies are at the higher levels. But, even if they were, there would be no assurance of software with relatively few defects.

A ..second way to answer the question is to have degree-granting institutions teach certain testing procedures as standard practice. This would assure that the software developers they graduate will routinely use those procedures whether their companies think to require them or not.

A third way is to make it part of practicing software development as a profession that one cannot properly sign off on a piece of software unless satisfied that it has been satisfactorily tested. Since a professional's being satisfied is not merely a matter of whether the test meets recommended technical standards (though it generally means at least that), an ethical standard provides another way of protecting end-users. Such protection is important in a field like software development. Change has been so fast that the technical standards have often been one or two steps behind the technology.

These three ways of answering the question of how much to test are, of course, not necessarily inconsistent. But there is a tension between them.

Because software development is such a large field, we propose to focus in this

first exploratory research on only one part of the field, testing of software for safety and reliability. This sub-field corresponds to one of the Working Groups the task force on Software Engineering Ethics and Professional Practices has set up--as well as to a specialty in software development itself. We plan to attach ourselves to this Working Group (Reliability and Safety) and follow its process from stating the problem, to gathering ideas, to deliberation, to final recommendation, to dissolution. We hope this will lead to a larger project that picks up from there. We envisage a more open-ended sequel that might include tracking the working group's recommendations through the task force's deliberations, the deliberations of the Joint Committee, and so on until final resolution (presumably, approval by the IEEE and ACM). We have formed a research team consisting of three members and three consultants to carry out our initial research plan. The members are Hene Burnstein (CS, an expert in the technical management of software development), Michael Davis (CSEP, an expert on business ethics and codes of ethics), and Vivian Weil (CSEP, expert on engineering ethics). The three consultants are Ullica Segerstrale (a social scientist working in science studies), Bogdan Korel (CS, an expert on software testing and debugging), and Barry Weiss (a lawyer versed in software liability issues). Our research plan has four parts:

1. The working group on reliability and testing plans to do most of its work by e-mail, with only a few face-to-face meetings. We can therefore study its work in large part by reading its mail (which is supposed to be open to everyone). We would complement reading the mail by telephone interview from time to time a) to clear up matters e-mail leaves unclear and b) to make sure we aren't missing anything important (for example, the fruit of phone conversations or an informal chat at a conference). We would also participate in the few face-to-face meetings (whether these turn out to be at conferences or by teleconference).
2. The three members of the research team will meet monthly to analyze the process recorded in e-mail (and what we have learned by phone). We will be especially concerned to identify issues in need of further study. Some



of this will simply be factual: for example, if an e-mail message refers to a technical standard none of us recognizes, we would have **to ask the most** appropriate member of the research group to find out what it is and why it matters. Some of the further study will, however, be of a different order: for example, if an e-mail message claims that a certain testing procedure makes ethical standards of a certain sort unnecessary (without explaining that claim), we might want to ask the author for an explanation; and, if asking fails to generate a satisfactory one, may want to search the literature for a rationale in order to assess the claim. We are interested in studying tensions that may arise between the educational approaches of computer science and engineering and between the role of technical methods and ethical standards in promoting appropriate standards of care. In studying how professionals develop and negotiate standards, we will attend to the reasons they give and try to identify factors that influence outcomes. We aim to obtain results generalizable to other groups. We will call upon the consultants as needed for information or help in analyzing what we observe.

3. This discussion, shadowing the official working group, should help us develop our own understanding of the issues with which the working group is dealing, an independent expertise, and--given our research group's make up--a perspective importantly different from the official working group's "insider" perspective. While we don't expect our view to be opposed to the (initial) views of the official working group, we do expect it to be different enough to be useful now and then, more because it will pick out or emphasize considerations insiders may overlook or, at least, fail to appreciate, than because of any fundamental disagreement
4. Once the working group completes its work, we will prepare a report summarizing and analyzing their work. The draft will be submitted to our consultants for comment and suggestions.

We expect this research to have at least four outcomes:

1. The report of what we have observed during the year of our initial study This should take the form a) of a report to the ACM and IEEE and b) of one or more research publications. Our research publications could contribute to three fields: the sociology of professions; professional ethics; and (perhaps) technical management

2. Enough contacts, experience, and insight propose a larger project to study the larger process of professionalizing software developers of which the working group activity is but a small part. Such a proposal would, of course, be contingent on the success of this project, but also on our making a determination, impossible to make now, about how much a larger project is likely to add to what we have already learned about the relation of individual responsibility, technical standards, and professional ethics.

3. Ideas for doing a better job of teaching testing to future software developers, whether trained in an engineering or computer science department. We expect these ideas to emerge from the continual contact between members of our interdisciplinary research team as they work together in the unusual circumstance of observing a new set of professional standards (and a new profession) coming into existence. We therefore view this project as, among other things, an aid to revising courses (or adding new ones) to better educate the next generation of software developers. Whatever useful ideas come out of our interdisciplinary meetings would, of course, also be published in an appropriate place--and may, then, lead as well to other new ideas for improving the continuing education of today's software developers.

4. Ideas the Joint Committee, its task force, or working -group may find useful. Because the Joint Committee has adopted an open process, allowing everyone to read the committee debate (on e-mail) and to respond, we hope to participate in that debate as well as monitor it, not only asking questions both substantive and procedural (for our benefit) but asking or answering questions for the benefit of the important work the Joint Committee is engaged in.

We have discussed our proposal with both Donald Gotterbarn, the Task Force's ACM Co-Chair, and Keith Miller, the chair of the Reliability and Safety Working Group. Both have welcomed us as potential participants as well as observers.

BIBLIOGRAPHY

Richard Lidger, "Cleanroom Process Model", IEEE Software (March 1994): 50-58.

Mark Paulk, Bill Curtis, Mary Beth Chrissis, "Capability Maturity Model, Version 1.1", IEEE Software (July 1993): 18-27.

## VIVIAN WEIL

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### **Education**

- The University of Illinois at Chicago, Ph.D. in Philosophy, 1972.
- The University of Chicago, M.A. in Philosophy, 1953 (Phi Beta Kappa).
- The University of Chicago, A.B., 1949.

### **Professional Appointments**

- Director and Associate Professor of Ethics, Center for the Study of Ethics in the Professions, Illinois Institute of Technology, 1987
- Director, Program on Ethics and Values Studies, National Science Foundation, 1990-91.

### **Grants and Honors**

- Fellow, American Association for the Advancement of Science.
- Consortium Member, "The Production of Educational Modules for the Teaching of Research Ethics," NSF, Dartmouth College, University of Montana, 1992-1995.
- Principal Investigator, Conference project on Engineering Ethics in Engineering Education, NSF (EVS), June 1, 1990 - May 31, 1992.
- Principal Investigator, Professional Ethics at the Interface of Engineering and Management, The Hitachi Foundation, September, 1988 - September 199(?).
- Principal Investigator, Research Project on National Security, The First Amendment, and Scientific and Technical Information, John D. and Catherine T. MacArthur Foundation, June, 1987 - September, 1990.

### **Selected Publications**

- Engineering Ethics in Engineering Education: Report of a Conference*, (NSF) CSEP Publication, 1992.
- Owning Scientific and Technical Information: Ethical Issues*. Rutgers University Press, coeditor with John Snapper, December, 1989.
- Special Issue on Applied Science, Guest Editor with Jon Nordby, *Synthese* Vol. 81, No. 3.
- Biotechnology: Professional Issues and Social Concerns* (HAAS Publication) co-editor with Paul DcForest, Mark Frankel, & Jeanne Poindexter, 1988.
- Beyond Whistleblowing. Defining Engineers' Responsibilities*, Proceedings of the Second National Conference on Ethics in Engineering. Chicago: CSEP (NSF Grant), December, 1983.
- "Is Engineering Ethics Just Business Ethics? What Can Empirical Findings Tell Us?" *International Journal of Applied Philosophy*, Vol. 8, No. 2, Winter/Spring 1994, pp. 9-15.
- "Ethics in Research and Graduate Education," in *Studies in Research Ethics*, No. 2, The Royal Society of Arts and Sciences, Gothenburg, Sweden, pp. 51-57.
- "Sharing Scientific Data II: Normative Issues" with Rachelle Hollander, *IRE A Review of Human Subjects Research*, Vol. 12, No. 2, pp. 7-8, reprinted as "Normative Issues in Data Sharing" in *Sharing Social Science Data*, ed. by Joan E. Sieber. Sage Publications: Newberry Park, 1991, pp. 151-156.
- "Military Research, Secrecy, and Ethics" in Mitcham, Carl and Philip Siekevitz (eds.), *Ethical Issues Associated With Scientific and Technological Research for the Military*. Annals of the New York Academy of Sciences, Vol. 577, 1989, pp. 193-199.
- "Policy Incentives and Constraints on Scientific and Technical Information," *Science, Technology, and Human Values*, Vol 13, Nos. 1 & 2, Winter & Spring 1988, pp. 17-26.

Michael Davis

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EDUCATION

- \*Western Reserve University, 1961-65: B.A. (Phil.)
- \*University of Michigan, 1965-1972: M.A. & Ph.D. (Phil.)
- \*University of Michigan, 1976-77: no degree (Law)

RECENT ACADEMIC APPOINTMENTS

1986-present, Illinois Institute of Technology,  
Senior Research Associate, Center for Study of  
Ethics in the Professions, and Adjunct  
Associate Professor of Philosophy.

RECENT GRANTS AND HONORS

- \*Who's Who in American Law
- \*Who's Who in American Education
- \*Hitachi Foundation, 1988-1990, with Vivian Weil (ethical problems raised by conflicts between engineering judgment and management decision-making).
- \*National Endowment for the Humanities Summer Seminar, 1990.
- \*National Science Foundation, 1991-1995 (Ethics-Across the-Curriculum: Integrating Ethics into Professional Education).

PUBLICATIONS

3 books, 3 monographs, 60 articles (9 reprinted), 12 chapters, 7 discussions, and 12 book reviews, including

- \*AIDS: Crisis in Professional Ethics, ed. (with Elliot Cohen). Temple University Press: Philadelphia, PA, 1993, forthcoming.
- \*To Make the Punishment Fit the Crime. Westview Press: Boulder, CO, 1992. 275pp.
- \*"Technical Decisions: Time to R-think the Engineer's Responsibilities?", Business & Professional Ethics Journal 11 (Fall-Winter 1992): 41-56.
- \*"University Research and the Wages of Commerce", Journal of College and University Law 18 (Summer 1991): 29-38.
- \*"On Teaching Cloistered Virtue: The Ethics of Teaching Students to Avoid Moral Risk", Teaching Philosophy 14 (September 1991): 259-276.
- \*"Thinking like an Engineer: The Place of a Code of Ethics in the Practice of a Profession", Philosophy and Public Affairs 20 (Spring 1991): 150-167.

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University of Maryland, College Park, MD. B.S.,  
Brooklyn College, Brooklyn, NY.

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Software Engineering: AI-based models, and intelligent systems for software testing and fault localization. Project management, testing management and testing maturity models .

Co-director: Center for Software Engineering Studies, Computer Science  
Department, Illinois Institute of Technology

Teaching Assignments:

Co-director: Specialized Computer Science Masters Degree in Software Engineering Program

Courses Currently Taught. Undergraduate: Software Engineering. Graduate:  
Software Testing and Quality Assurance. Programming Project

- Management, Advanced Software Engineering Laboratory.

Recent Publications:

I. Burnstein, C. Chang, C. Tseng, "Modeling the Fault Localization Process with a Blackboard-Based Fault Localization Tool", Proc. Third Midwest AI and Cognitive Society Conf., Carbondale, IL, pp 112-116, April, 1991.

I. Burnstein, S. Mannina. " A Conceptual Model for the Software Fault Localization Process". Proc. Fourth Midwest AI and Cognitive Society Conf., Utica, IL, pp 21-25, May, 1992.

I. Burnstein, N. Jani, S. Mannina, I. Tamsevicious, M. Goldshteyn, L. Lendi, "Intelligent Fault Localization in Software", Proc. IEEE International Test Conference 1992, , Md, pp 917-926, Sept, 1992.

I. Burnstein, N. Jani, S. Mannina, J. Tamsevicious, M. Goldshteyn, L. Lendi, "The Development of A Knowledge-Based Software Fault Localization Tool", Proc. 1992 IEEE International Conference of Systems, Man and Cybernetics, Chicago, III, pp 317-322, Oct., 1992.

I. Burnstein, B. Glicklich, "Defining a Program Chunk for Use in Automated Fault Localization", Fifth Midwest AI and Cognitive Society Conf, Chesterton, IN, pp 98-102, April, 1993.

I. Burnstein, C. Robert Carlson, "Developing Leadership Skills in Software Engineering Students Through an Undergraduate Research Program". To appear in: Proc. 8th SEI Conf. on Software Engineering Education, New Orleans, LA, March, 1995.

## BIOGRAPHICAL SKETCH

**NAME:** Bogdan Korel  
Department of Computer Science  
Illinois Institute of Technology  
Chicago, IL 60616

**PRESENT RANK:** Associate Professor

**ACADEMIC EXPERIENCE:**

Associate Professor, Illinois Institute of Technology, 1994-present

Assistant Professor, Wayne State University, 1987-1994

Lecturer, Wayne State University, 1986-1987

**EDUCATION:** Technical University of Kiev, Kiev, MS., Electrical Engineering, 1974, graduation with distinction. Oakland University, Rochester, MI, Ph.D., Systems Engineering, 1986.

**TEACHING:** Taught many undergraduate and graduate computer science courses. Founded together with Prof Ilene Burnstein the MS Program in Software Engineering in the Illinois Institute of Technology.

**RESEARCH AREA:**

Software Engineering, software testing, automated test data generation, program slicing, automated debugging, software maintenance. Part of this research has been funded by NSF and the industry. The results of this research have been published in over 40 journal and conference papers.

**SERVICE** Served as a program committee member for several confer. Refereed proposals for NSF and refereed research papers for many journals and conference.

**LIST OF MAJOR PUBLICATIONS:**

B. Korel, J. Laski, "Dynamic Slicing in Computer Programs," The Journal of Systems and Software, vol. 13, No. 3, November 1990, pp. 187-195.

B. Korel, "Automated test data generation," IEEE Transactions on Software Engineering, vol. SE-16, No. 8, August 1990, pp. 870-879.

B. Korel, "PELAS-Program Error-Locating Assistant System," IEEE Transactions on Software Engineering, vol. SE-16, No. 8, August 1990, pp. 187-195.

B. Korel, "Dynamic method of software test data generation," Journal of Testing, Verification, and Reliability, vol. 2, No. 4, 1992, pp. 203-213.

B. Korel, "The program dependence graph in static program testing," Information Processing Letters, vol. 24, No. 2, 1987, pp. 103-108.

J. Laski, B. Korel, "A data flow oriented program testing strategy," IEEE Transactions on Software Engineering, vol. SE-9, No. 3, May 1983, pp. 347-354.

B. Korel, H. Wedde, R Ferguson, "Dynamic method of test data generation for distributed software," Information and Software Technology Journal, vol. 34, No. 8, August 1992, pp. 523-531.

CURRICULUM VITAE

Ullica Segerstrale

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Illinois Institute of Technology (IIT), Chicago, IL 60616

EDUCATION: Ph.D 1983 Harvard University (Sociology)  
M.A. 1975 University of Pennsylvania, (Communications)  
M.Pol.Sci. 1973 University of Helsinki, Finland  
M.S. 1970 University of Helsinki, Finland

EMPLOYMENT:

1992- Associate Professor, Dept. of Social Sciences, IIT.  
1988-92 Assistant Professor, Dept. of Social Sciences, IIT.  
1989-1991 Senior Researcher, Academy of Finland (working at IIT).  
1986-1987 Acting Chair and Professor, Sociology, Abo Akademi, Finland  
(the Swedish-speaking university in Finland).  
1983-1986 Lecturer and Visiting Assistant Professor, Smith College.

GRANTS, AWARDS AND HONORS (selected):

1991-92 Fellow of the Zentrum fur Interdisziplinare Forschung  
— (ZIF), Bielefeld, Germany. Project on culture and biology.  
1988 Senior Researcher, Academy of Finland, 2 1/2 years  
1986 Elected Member of Sigma Xi.  
1974 Fulbright Fellowship and Travel Award  
1974 Fellow of the Salzburg Seminar in American Studies

PUBLICATIONS (selected):

Ullica Segerstrhle and Peter Molnar (eds.), Where Nature Meets Culture: Nonverbal Communication in Social Interaction. Hillsdale, N.J., Lawrence Erlbaum Publishers (forthcoming).

"Good to the Last Drop? Millikan Stories as Canned Pedagogy." Ethics in Science and Engineering (conditionally accepted)

"The Murky Borderland between Scientific Intuition and Fraud." In: Edward Erwin et al. (eds). Ethical Issues in Scientific Research, Garland Publishers, 1994. (From Int. J. of Appl. Phil. Spring 1990).

"The Hard Program in the Sociology of Scientific Knowledge. A Manifesto," with Warren Schmaus and Doug Jesseph. Social Epistemology, Vol. 6, No. 3, 1992 (issue devoted to article and peer



ORGANIZER AND CHAIR OF SYMPOSIA, PANELS AND CONFERENCES (selected)

1995 Co-organizer: Symposium "Changing the Terms of the Biotechnology Debate," AAAS, Atlanta, February 16-21.

1993 Co-organizer: Panel "Tales from the Front: Telling Stories about Scientific Misconduct. 4 S, West Lafayette, IL, Nov. 19-21.

1992 Co-organizer: International conference "Nonverbal Communication and the Genesis of Culture," ZIF, Bielefeld, Germany.

1990 Co-director of course: "Sociology of Science: Science, Social Controversies and Ethics," Dubrovnik, Yugoslavia, May 10-20.

1989 Organizer and Chair: "Research Ethics: Science, Universities and the Public," (4 S), Irvine, CA, Nov. 15-18.

OTHER PROFESSIONAL ACTIVITIES (selected)

Associate Editor, Science Studies, 1988 Editorial Committee, Perspectives on the Professions, 1989 Advisory Board, Center for the Study of Ethics in the Professions, IIT, 1988

More than 70 invited presentations and colloquia, among others in Bremen, Berlin, Gothenburg, Uppsala, Madrid, Amsterdam, Jerusalem, Haifa, Kyoto, Tokyo; in the U.S. among others at Harvard, Yale, Ann Arbor.

10 book reviews, mainly concerning ethical issues and scientific controversies; 3 in Science.

# B A R R Y D. W E I S S

Barry D. Weiss has a background in computer programming and engineering and concentrates on technology related matters, including litigation and trial work, mediation, arbitration, counseling, and transactions involving intellectual property, licensing, and related issues. He received a B.A. from University of Illinois at Chicago with a major in the history of architecture, and a J.D. with highest honors from Illinois Institute of Technology/Chicago Kent College of Law in 1983. He is admitted to practice law in Illinois and before the United States District Court for the Northern District of Illinois. He is a member of the Trial Bar for the United States District Court for the Northern District of Illinois. Mr. Weiss currently serves on the board of directors of MAI Systems, Inc., an international computer and software systems company. He is a member of the Intellectual Property, Litigation, and Dispute Resolution Sections of the American Bar Association, including the Computer Litigation Committee, the Computer Law Association, and the Chicago Software Association Quality Round Table, and he has served on various committees for the Information Technology Association of America and the Society for Information Management.

SUMMARY		03/15/1995-03/14/1996	
PROPOSAL BUDGET		FOR NSF UM ONLY	
ORGANIZATION Illinois Institute of Technology		PROPOSAL No.	DURATION
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR		AWARD NO.	
A. SENIOR PERSONNEL PI/PD Co-PI's. Faculty and Other Senior Associates NSF Funded (Ust each separately wish goo. A.7. show number h brackets person-mos CAL ACAD SIR		funds Requested Br Granted Bar Diff Proposer	
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2. Davis, Michael 0-9;		0-7rl	
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7. TOTAL SENIOR PERSONNEL 1			
8.OTHER PERSONNEL. SHOW NUMBERS IN BRACKETS)			
POST DOCTORAL ASSOCIATES			
OTHER PROFESSIONALS CLAN, PROGRAMMER, ETC			
3 GRADUATE STUDENTS			
• UNDERGRADUATE STUDENTS			
S. SECRETARIAL • CLERICAL			
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## Budget Justification

1. We have figured the IIT consultants at .25 month summer salary and the outside consultant at 2 days @ \$500/day.
2. The graduate student will assist with research and clerical tasks (150 hours @ \$8.00/hr).
3. We will require secretarial and library support that goes beyond the normal duties of those positions.
4. We have figured travel to include 2 face-to-face meetings for 1 or 2 each @ \$2,500 and dissemination of results at conferences and association meetings (more travel, same 1 or 2) @ \$2,500.
5. Other (under Other Direct Costs) includes long distance calls, teleconferencing, mail, and any data base searches and document delivery.

### Current and Pending Support

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.			
Investigator: Vivian Weil		Other agencies (including NSF) to which this proposal has been/will be submitted.	
Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future
<input type="checkbox"/> *Transfer of Support			
Project/Proposal Title:			
Production of Educational Modules for the Teaching of Research Ethics			
Source of Support: National Science Foundation			
Award Amount (or Annual Rate): \$ 10,000		Period Covered: 9/1/93 - 5/1/95	
Location of Project: IIT - Center for the Study of Ethics in the Professions			
Person-Months Committed to the Project:		Cal:	Acad: 1.5(est) Summ:
Support:	<input type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future
<input type="checkbox"/> *Transfer of Support			
Project/Proposal Title:			
Source of Support:			
Award Amount (or Annual Rate): \$		Period Covered:	
Location of Project:			
Person-Months Committed to the Project:		Cal:	Acad: Summ:
Support:	<input type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future
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Project/Proposal Title:			
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Award Amount (or Annual Rate): \$		Period Covered:	
Location of Project:			
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Source of Support:			
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Person-Months Committed to the Project:		Cal:	Acad: Summ:
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Project/Proposal Title:			
Source of Support:			
Award Amount (or Annual Rate): \$		Period Covered:	
Location of Project:			
Person-Months Committed to the Project:		Cal:	Acad: Summ:
Support:	<input type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future</

Current and Pending Support

The following information should be provided by the Investigator and co-investigator(s) and senior personnel must provide the information requested in this proposal

Investigator's Name: Michael Davis

Other (Including NSF) from which this proposal has been submitted

Support Status: Current 13 Pending 0 Submission Planned

IA Now Future E) T(01 &"M

Project/Proposal Title: Professional Autonomy of Engineers: Developing a Framework for Empirical Research

Source of Support: National Science Foundation

25,384 Period Covered 4/6/94 - 7/31/95

IIT Center for the Study of Ethics in the Professions

Person-Months Committed by Project: 3

Aced Summ:

Support Status: Pending 0 Submission Planned in Near Future 0 Transfer of Support

Project/Proposal Title: Ethics Across the Curriculum - A Campus-Wide Approach

Source of Support: National Science Foundation

211,464 Period Covered 1/1/91 - 6/30/95

IIT Center for the Study of Ethics in the Professions

Person-Months Committed by Project: 75

Call . 75 Summ:

Support Status: Pending 0 Submission Planned in Near Future 0 Transfer of Support

Source of Support: a

Award Amount (or Annual Rate): = Period Covered

Location of Project: a

Person-Months Committed by Project: 1110

Cat Aced Summ.

Support Status: Pending 0 Submission Planned in Near Future 0 Transfer of Support

Project/Proposal Title: (I Pending)

Source of Support: a

Award Amount (or Annual Rate): = Period Covered

Location of Project: a

Person-Months Committed by Project: 1110

Cat Aced &MM

Support Status: Current 0 Pending 13 Submission Planned

in Near Future 0 Transfer of Support

Project/Proposal Title: a

Source of Support: a

Award Amount (or Annual Rate): = Period Covered

Location of Project: a

Person-Months Committed by Project: 1110

Cat Aced: Sort=

If this project has been previously funded by another agency, please list and furnish information for immediately previous funding period

## Current and Pending Support

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Ilene Burnstein	Other agencies (including NSF) to which this proposal has been/will be submitted.
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Support: <input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support
Project/Proposal Title: A Center for Undergraduate Research in Computer Science at IIT	
Source of Support: National Science Foundation	
Award Amount (or Annual Rate): \$ 47,500      Period Covered: 9/1/92 - 2/28/95	
Location of Project: IIT Center for the Study of Ethics in the Professions	
Person-Months Committed to the Project:      Cat:      Acad:      Summ: 2.4	

  

Support: <input type="checkbox"/> Current	<input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support
Project/Proposal Title:	
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Person-Months Committed to the Project:      Cat:      Acad:      Summ:	

  

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Award Amount (or Annual Rate): \$      Period Covered:	
Location of Project:	
Person-Months Committed to the Project:      Cat:      Acad:      Summ:	

  

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Source of Support:	
Award Amount (or Annual Rate): \$      Period Covered:	
Location of Project:	
Person-Months Committed to the Project:      Cat:      Acad:      Summ:	

\*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

34

J54 7-FEB-1995 09:27:26.11

MZ

From: miller@sangamon.edu "Keith Miller"  
 To: IN%"CSEPWEIL@m~nna.acc.iit.edu"  
 CC: IN\$"miller@eagle.sangamon.edu"  
 Subj: RE: proposal

Return-path: <miller@sangamon.edu> Received: from eagle.sangamon.edu by minna.acc.iit.edu (PMDF V4.3-10 #5435) id <OlHKRHCCXX609FRFOE@minna.acc.iit.edu>; Tue, 07 Feb 1995 09:27:13 -0500 (CDT) Received: by eagle.sangamon.edu (1.37.109.11/16.2) id AA139250906; Tue, 7 Feb 1995 09:28:27 -0600 Date: Tue, 07 Feb 1995 09:28:26 -0800 (CST) From: Keith Miller <miller@sangamon.edu> Subject: Re: proposal In-reply-to: <OIHMQFP30SEA9N3ZCI@minna.acc.iit.edu> from "Vivian Weil" at Feb

6, 95 03:29:22 pm

To: CSEPWEIL@minna.acc.iit.edu (Vivian Weil)  
 Cc: miller@eagle.sangamon.edu (Keith Miller)  
 Message-id: <OIHMRFiCD107M9FRFOE@minna.acc.iit.edu>  
 Press RETURN for more  
 MAIL>

#54 7-FEB-1995 09:27:26.11

MA

Content-type: text  
 Content-transfer-encoding: 7BIT  
 Content-length: 1353  
 > To: Keith Miller  
 > From: Vivian Weil  
 > We had already heard about you from Deborah Johnson and then  
 > learned that you chat the SEEP working group we wish to attach  
 > ourselves to as researchers rather than as participants of the usual  
 > kind. We plan to submit a proposal to NSF's Ethics and Values Studies  
 > Program for support of a research project to study this task force  
 > effort to help the occupational group of software developers become a  
 > profession.  
 > Our broad interests are professionalism and accountability, and  
 > our focus is on testing of software to assure safety and reliability.  
 > Donald Gotterbarn knows about and approves our proposal. We hope  
 > that you would welcome the research effort we propose.  
 Press RETURN for more...

MAIL&gt;

#54 7-FEB-1995 09:27:26.11

MAI

> Vivian Weil

This sounds fine to me. I don't know exactly what you mean by "attach ourselves." Sounds a bit biologically invasive, don't you think? :) Sounds like your interests and mine are very close. My only regret is that you won't be participating directly. Let me know how I can help.  
 Keith

Keith Miller  
 miller@eagle.sangamon.edu  
 office: (217) 786-7327  
 fax: (217) 786-7327

NECC '95 Program Chair  
 Sangamon State University  
 Computer Science Department, HSB 137  
 Springfield, Illinois 62794



