ICSE 97
International Conference
on Software Engineering

Pulling Together

FINAL PROGRAM

Sponsored by the ACM Special Interest Group on Software Engineering (SIGSOFT) and IEEE Computer Society — Technical Council on Software Engineering (TCSE)

Boston, Massachusetts USA
Sheraton Boston Hotel & Towers
May 17–23, 1997
Welcome to the 1997 International Conference on Software Engineering, ICSE 97. The theme of ICSE 97 is "Pulling Together." Pulling together denotes coordinated action of many individuals in achieving a common goal. It also describes the coming together of many different perspectives, concerns, and abilities to find a common ground and a way of achieving cooperation. Pulling together is fundamentally dynamic in nature, and is often a matter of explicit negotiation and communication.

Major changes have been instituted in ICSE 97 to help the software engineering community pull together, in the full sense of that phrase. The conference is a reflection of the vision that the organizing committee had when planning began back in 1994. A broadened outlook for the conference challenges old beliefs, promotes new ideas and new synergies, and provides for a dynamic, exciting program. New or expanded conference activities include a doctoral symposium, lessons and reports from software engineering organizations, and posters. A major addition to the conference is a suite of sessions and activities focusing on the interests and needs of the practicing professional. Numerous invited presentations, timely panel topics, experience reports, and an expanded tutorial program are included.

Everyone associated with planning ICSE 97 has focused from the outset on expanding the community of attendees for the conference. We have looked toward increased scope of topics and a broader range of attendees, while still preserving the traditional technical program that has served the conference well over the years. With the help of a Professional Program committee, we have expanded the number of invited speakers while also including the traditional invited keynote speakers. These invited speakers include well-known technologists and consultants, many of whom are regular speakers at commercially-sponsored conferences.

Papers constitute the core of the Technical Program. Research papers describe innovative and significant work in the research and practice of software engineering. Experience reports describe the application of software engineering methods, theory or tools to the development of significant software products. Of the 219 full technical papers submitted for review, the program committee accepted 41 research papers and 9 experience reports. A new element, Software Engineering in Organizations: Lessons and Status Reports, attracted 18 submissions of which 11 appear in the conference.

As with previous ICSEs the main conference is accompanied by a tutorial and workshop program. This year the number of tutorials and range of topics was substantially expanded. Workshops enable intensive focus on specific topics of interest, typically in a form which encourages interaction among the participants. nine workshops and co-located symposia help round out this year's ICSE.

We are pleased you could join us.

W. Richards Adrion
ICSE 97 General Chair

Alfonso Fuggetta, Richard N. Taylor, Anthony I. Wasserman
ICSE 97 Program Coordinators
Beyond Software Engineering: Ten Imperatives for the Successful Software Developer at the End of the Decade
by Ed Yourdon

Edward Yourdon, methodologist, author, consultant, and publisher of American Programmer, developed the “Yourdon method” of structured systems analysis and design implemented on most of today’s CASE software engineering tools, and is a world expert in software engineering. Author of 20 textbooks and more than 200 articles, he chairs international conferences on CASE technology, is a Professor at Universidad CAECE in Buenos Aires, and has received numerous honors and awards from universities and societies worldwide.

Java and the Evolution of Web Software
by Guy Steele

Guy L. Steele Jr. is a Distinguished Engineer at Sun Microsystems Laboratories in Chelmsford, Massachusetts, and is responsible for research in programming languages, parallel algorithms, implementation strategies, and architectural and software support. He is working with James Gosling and Bill Joy on the detailed specification of the Java programming language. An ACM Fellow and a Fellow of the AAAI, he was a senior scientist at Thinking Machines Corporation, a member of technical staff at Tartan Laboratories, and an assistant professor at Carnegie-Mellon University.

Software Engineering That Matters to People
by Mark Weiser

Mark Weiser is chief technologist at the Xerox Palo Alto Research Center (PARC). Prior to joining PARC, Weiser taught at the University of Maryland from 1979 to 1987, where he headed the Computer Science Laboratory. Weiser has started three companies, and he has written more than 75 technical publications. His Ubiquitous Computing program envisions PCs being replaced with invisible computers embedded in everyday objects. Weiser is the drummer with rock band Severe Tire Damage, the first live band on the Internet.
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<td>Migration Strategies for Legacy Systems</td>
<td>Living with Inconsistency</td>
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<td>Defining Families: The Commonality Analysis</td>
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ICSE97
Conference Map
Symposium on Software Reusability
Sat (begins 9 am), Sun. & Mon. • May 17,18,19  HILTON HOTEL

The Symposium on Software Reusability is ACM’s bi-annual forum for the exchange of ideas, research and development results and experiences in all aspects of software reusability. SSR’97 invites you to participate in tutorials, keynotes, panels, and all aspects of the technical program. The technical program consists of paper presentations and panels on current topics in software reusability. Paper sessions include the latest developments in software architecture, domain analysis and engineering, object-oriented reuse, reuse on the Internet, and application generators and program transformation. The panels provide a chance for lively interaction with experts in the field. Saturday–Monday, May 17–19. (SSR tutorials are held Saturday) Contact: Guillermo Arango, (arango@montrouge.wireline.slb.com )

http://www.owego.com/~ssr97/

Living With Inconsistency
Saturday•May 17•8:30 am-6:00 pm  BEACON E

In this workshop, we take a broader view. We are interested in living with inconsistency as part of doing requirements engineering. While some types of inconsistency can be detected and removed early on, other types may not even be noticeable until a system is in production for months or years. Contact: Steph Fickas (fickas@cs.uoregon.edu)


The Second ISEW Cleanroom Workshop
Saturday•May 17•9:00am-5:00pm  BEACON D

An opportunity for practitioners and researchers active in Cleanroom to exchange experiences and discuss problems of common interest. Contact: Graeme Smith (gs@q-labs.de.

http://www.q-labs.com/isew_icse.html

Software Engineering for Parallel and Distributed Systems
Saturday (begins 8:30am) & Sunday • May 17 & 18  FAIRFAX B

The aim of PDSE’97 is to continue to provide a forum for exchange of information and publication of the latest technological and theoretical advances in software engineering for parallel and distributed systems. The workshop will focus on the problems that are unique to the software engineer developing parallel and distributed systems.Contact: Stefano Russo (russo@nadiis.dis.unina.it)

http://www-osl.cs.uiuc.edu/PDSE97/welcome.html

Software Engineering on the Web
Monday • May 19 • 9:00am-6:00pm  CLARENDON

This workshop identifies near and midterm goals of how best to develop and use the world wide web for software engineering. Contact: David Eichmann (eichmann@ricis.cl.uh.edu)

http://ricis.cl.uh.edu/SEWWW/

Seventh International Workshop on Software Configuration Management (SCM7)
Sunday (begins 10:50 am) & Monday, May 18 & 19  DALTON

SCM is the discipline of managing the evolution of families of software systems. It involves supporting the versioning, com-
**TUTORIALS**

**SESSION 1: SUNDAY, 9 A.M.–6 P.M.**

**Software Process Improvement: Methods and Lessons Learned**  
*Bill Curtis*  
**HAMPTON**  
1A The growing functionality expected from modern products and systems has resulted in an exponential growth in the software required to run them. During the 1970s and the early 1980s, software developers focused their investments on advanced workstations, languages, and CASE tools to improve their performance. The benefits of these investments were far lower than promised. A software process movement emerged in the mid-1980s when shortcomings in managing development and maintenance processes were recognized as prime inhibitors of growth in software productivity and quality.

**A Realistic, Commercially Robust Process for the Development of Object-Oriented Software Systems — Case Study**  
*Tim Korson*  
**BERKELEY**  
1B The successful adoption of object technology requires far more than simply the adoption of an OO language. Methods for OO analysis and design must be selected and configured to fit within an overall software development process. This session examines the required elements of a realistic, commercially robust process for the development of object-oriented software systems.

**Software-Reliability-Engineered Testing Practice**  
*John D. Musa*  
**BEACON D**  
1C SRET is testing of software-based systems which employs reliability objectives and profiles of system use to speed testing while ensuring the necessary reliability. It helps us deal with the pressure to get software-based products to market faster while still meeting customer reliability needs. You will learn how to perform the major activities of SRET: defining “necessary” reliability, developing operational profiles, preparing for testing, executing tests, and interpreting failure data. The tutorial uses a simple but realistic example throughout to illustrate the points.

**Java: A Language for Software Engineering**  
*Jim Waldo*  
**FAIRFAX A**  
1D Java, an object-oriented language that allows dynamic loading of binary code over a network of heterogeneous machines, includes features to write robust, error-free code and thus presents a platform for serious software engineering. We will examine the packages that allow Java to be used in traditional distributed systems programming and for more advanced, Java-only environments that support the Remote Method Invocation system.

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**SESSION 2: SUNDAY, 8 A.M.–NOON**

**Software Interoperability: Principles and Practice**  
*Jack Wileden, Alan Kaplan*  
**EXETER**  
2A Software interoperability is fundamental to such topics as development based on components, reuse, and infrastructure for distributed or network-based systems. As a result, a variety of (often partial) approaches to interoperability have appeared, each offering a potential solution to interoperability problems. Yet what these approaches offer, how they compare, and exactly what problems they are solving is generally unclear. Some foundations for understanding and evaluating interoperability problems and proposed approaches for solving those problems.
**Distributed Software Architectures**
*Jeff Kramer, Jeff Magee*

Software architectures has been identified as a critical design concern when bridging the gap between system requirements and implementation, particularly in large, complex software systems. Software Architecture is the structure of the components of a program or system, their interrelationships, and principles and guidelines governing their design and evolution over time. It provides a clear and well-defined level at which to describe, understand, and analyze system designs.

**Effective Use of COTS (Commercial-Off-the-Shelf) Software Components in Long Lived Systems**
*W. Morven Gentleman*

This tutorial looks at kinds of COTS software components that can be used in long lived systems, and the technology available for building around them. The potential benefits and risks of this approach to systems are examined. Modifications of conventional development processes are required to focus on where time and cost expenditures occur, and where risks arise.

**Rigorous Requirements for Real-Time Systems: Evolution and Application of the SCR Method**
*Stuart Faulk, Connie Heitmeyer*

SCR, a practical formal requirements method, can reduce critical errors and decrease costs in industrial development of embedded, high-assurance systems. Requirements errors remain the most intractable and costly problem in embedded software development. Formal methods offer techniques for early error detection and correction but are widely perceived as impractical for large, complex, embedded systems. SCR has systematically addressed the problems of industrial use of formal requirements methods. The resulting methods and tools offer a proven, practical, industrial-strength approach for formal specification and analysis of critical system requirements.

**Software and Business Process Technology**
*Volker Grahn, Wilhelm Schaefer*

The state-of-the-art technology in software process and business process technology and its exploitation in an industrial context includes languages, tools, and substrates (database and operating system functionality) being used to model, analyze, and execute business and software processes. The industrial context is based on building, using, and selling a complete workflow environment including tools for modeling, analyzing, and executing workflows. This environment called LEU (LION Environment) is used in various industrial sectors like real estate, software process, and insurance.

**An Introduction to OMG/CORBA**
*Wolfgang Emmerich*

The Common Object Request Broker Architecture (CORBA) standard adopted by the Object Management Group (OMG) is the industry standard middleware for heterogeneous and distributed object-oriented computing. Participants will be provided with an overview of the different constituents of the CORBA standard. Although the main focus of the tutorial is on the standard and its rationales, participants will also be provided with a brief overview of the most important products implementing CORBA.

**SESSION 3: SUNDAY, 1–5 P.M.**

**Jeff Kramer** is a Professor at Imperial College, and head of the Distributed Software Engineering research section. His research interests include requirement analysis techniques, design and analysis methods, software construction languages and software development environments. Jeff Magee is assistant director of the Department of Computing at Imperial College. His interests include software engineering of parallel and distributed systems.

**W. Morven Gentleman** heads the Software Engineering Laboratory in the Institute for Information Technology at the National Research Council of Canada. He has taught at the University of Waterloo and has been among the technical staff at Bell Telephone Laboratories. His Ph.D. from Princeton in 1966 is in Mathematics. His research activities include software engineering, computer architecture, robotics, computer algebra, and numerical analysis.

**Stuart Faulk** is on the faculty of the University of Oregon’s Department of Computer and Information Science. Previously, he led the development of the Consortium Requirements Engineering Method (CoRE) and successfully applied the SCR method in industry. Connie Heitmeyer heads the Software Engineering Section of the Naval Research Laboratory’s High Assurance Computer Systems branch. She leads research and development efforts in formal methods and CASE tools supporting the construction of real-time, embedded software.

**Dr. Volker Grahn** has been chief technical officer of a German software house called LION since 1992. He is responsible for a software development department of 150 people. Dr. Wilhelm Schaefer is professor of Computer Science at the University of Paderborn, Germany. Prior appointments have been at the University of Dortmund and McGill University in Montreal and a position in industry where he served as the head of an RD department of a medium-size software house focussing on CASE tools and information systems.

**Dr. Wolfgang Emmerich** is a senior consultant of the OMG representative in Central Europe, LogOn Technology Transfer. Dr. Emmerich has given numerous CORBA training courses to the software industry in many European countries and consulted on the use of CORBA in companies and software houses. Dr. Emmerich is also a Lecturer at City University London, where he teaches distributed systems and software engineering.
Frank E. McGarry is a senior member of the Executive Staff at Computer Sciences Corporation after having spent 28 years at NASA/ Goddard, where he headed the Software Engineering Branch. Victor Basili is a professor of computer science at the Institute for Advanced Computer Studies at the University of Maryland at College Park, where he served as chairman for six years. His interests include quantitative approaches for software management, engineering, and quality assurance.

Watts S. Humphrey founded the Software Process Program of the Software Engineering Institute at Carnegie Mellon University. He is a Fellow of the Institute and is a research scientist on its staff. He was director of programming quality and process at IBM. James Over, a Senior Member of the Technical Staff at the Software Engineering Institute (SEI), has worked in several technical areas within the SEI Software Process Program. His interests include software engineering, software process, and quality management. He is the co-author of publications on software process definition and improvement.

Bashar Nuseibeh is head of the Software Engineering Laboratory at Imperial College, London. His research interests are in distributed software engineering, and he is working on supporting multiple views and managing inconsistencies in software development. Suzanne Robertson is a teacher and consultant specializing in modelling techniques for system development. She has co-authored courses on systems analysis and software design for systems, requirements engineering, quality assessment and problem solving. She develops techniques for identifying and reusing requirements.

Mark Ardis, a member of the Technical Staff in the Software Production Research Department at Bell Laboratories, Lucent Technologies, taught software engineering courses at the University of Illinois at Urbana-Champaign, the Wang Institute of Graduate Studies, and Carnegie Mellon University (CMU). David Weiss is the head of the Software Production Research Department at Bell Laboratories, Lucent Technologies. He has been director of reuse and measurement for the Software Productivity Consortium.

Shari Lawrence Pfleeger is president of Systems/ Software Inc., a consultancy specializing in software engineering research and technology transfer. In addition, she is a visiting professorial research fellow at City University’s Centre for Software Reliability.

SESSION 4: MONDAY, 9–6 P.M.

The Experience Factory: How to Build and Run One
Vic Basili, Frank McGarry

This course presents the fundamental concepts behind software process and product improvement using measurement and evaluation in an Experience Factory Organization. It will provide a set of examples associated with understanding the software engineering process, product, and environment, improving it over time and packaging experience in the form of models and measures to create an experience base that can be reused by future projects. It discusses how this approach is being used in the Software Engineering Laboratory (SEL) at NASA/ Goddard Space Flight Center and how it has been expanded to other NASA sites and to other production environments in private corporations such as Computer Sciences Corporation (CSC).

The Personal Process (PSP)™
Watts S. Humphrey, James W. Over

The PSP method uses quality management principles and the Capability Maturity Model (CMM)™ framework and uses sound engineering principles in software development and maintenance work. The principal message of the PSP is that engineers should use process management concepts to identify and perfect the methods that are most effective for them. Engineers using PSP significantly improve the quality of their work, learn how to plan their projects, and improve their productivity. Average quality improvements of five to ten times are normal, as are productivity improvements of 25% or more.

Making Requirements Measurable
Bashar Nuseibeh, Suzanne Robertson

Participants in this interactive full-day tutorial examine measurability by building a requirements specification for a familiar system. After presenting an overview of requirements engineering activities, the tutorial focuses on how to measure requirements for testability, relevance, completeness, consistency, coherency, traceability and satisfaction. A requirements template is used as a guide to discovering requirements and building the specification. A requirement is “measurable” if there is an unambiguous way of determining whether a given solution fits that requirement.

Defining Families: The Commonality Analysis
Mark Ardis, David Weiss

One approach of systematically engineering software domains is to develop families of software and to invest in facilities for rapidly producing family members. This full-day tutorial describes the commonality analysis process, a systematic approach to analyzing families. The result of the analysis forms the basis for designing reusable assets that can rapidly produce family members. A practice commonality analysis will be guided by experienced users of the process.

Evaluating Software Technology
Shari Lawrence Pfleeger

This tutorial examines the issues involved in evaluating the effects of software methods and tools on our products, processes and resources. It reviews measurement theory and the basics of experimental design and analysis to suggest guidelines for how we should investigate the benefits and costs of our actions. Principles are illustrated with actual industrial examples, including two in-depth case studies. In addition to designing our own investigations, the tutorial enables us to understand when the results of others apply to our own situations.
A Survey of Object-Oriented Analysis and Design Methods

Martin Fowler

A guided tour of common OO techniques, some less-known but valuable techniques, and where to go for more information. We explore techniques for structural, architectural, and behavioral modeling with process techniques used in OO development. The tutorial discusses the Unified Modeling Language, model perspectives, design by contract, event modeling, and the translation process.

Simplifying the Evolution of Java Programs

Linda Seiter, Karl Lieberherr, Doug Orleans

An in-depth look at the ability of existing models and languages to support different forms of reuse and evolution. We present techniques for achieving dynamic behavior in a static, class-based model and language. We present the public-domain programming tool Demeter/Java, which implements a special kind of context object, called a visitor object. To enable the direct expression of visitor objects and to express traversal strategies for objects in Java, we present a simple, public domain, programming tool extension to Java (the Demeter/Java language) and show how it is translated back into Java. Programs become more flexible, both structurally and behaviorally — and also shorter.

A Primer on Empirical Studies

Dewayne E. Perry, Adam A. Porter, and Lawrence G. Votta

A sound empirical basis for software and process engineering and research by focusing on the basic characteristics of empirical studies. The key to empirical work is credibility — everything else follows from this primary characteristic. We advocate a model in which there is more control involved, resulting in more detailed information gathered. Rather than emphasize general phenomenology, we emphasize trying to find underlying mechanisms. Attendees assess the credibility of empirical work either as reported in the software engineering literature or as done by themselves and to apply the results to their own work.

Reverse Engineering Strategies for Software Migration

Hausi A. Muller

The need to maintain and improve software and information systems has risen dramatically over the past decade. Dealing with old software systems that are billion-dollar assets to corporations and governments is a critical problem. Migrating and reengineering involves capturing, preserving, and extending knowledge about software, analyzing and understanding software, and evolving software. Reverse engineering approaches have been particularly useful in the arena of reverse engineering: the process of generating new information about software.

A Software Process Improvement Approach Tailored for Small Organizations and Small Projects

Judith G. Brodman, Donna L. Johnson

A small organization or project faces issues when implementing a software process improvement program. Alternative practices that satisfy the intent of the SEI’s Capability Maturity Model (CMM) practices and goals address the setting up and sustaining of a viable process improvement program. The growth pattern shows areas of improvement as an organization matures — vertical linkages between process areas through the levels of the CMM and the evolutionary definition of metrics through the levels of maturity.
Wolfgang Pree is Associate Professor at the University of Linz. He is author of Design Patterns for Object-Oriented Software Development (Addison-Wesley/ACM Press, 1995) and of Framework Patterns (SIGS Books, New York City, 1996). Hermann Sikora is a managing director of RACON Linz Software, Inc., a company owned by and producing software for the largest private bank consortium in Austria. Sikora holds a Ph.D. in computer science and a degree in management information systems.

Stefan Fischer is a graduate of the University of Mannheim. Formerly a research assistant at the Institute of Applied Computer Science (Department for Computer Networks) of the University of Mannheim, he is a postdoctoral fellow at the University of Montreal, Canada. Stefan Leue received his Master’s Degree in Computer Science from the University of Hamburg in 1990, and his Ph.D. degree from the University of Berne. Formerly a research associate and doctoral candidate at the University of Berne, he is an Assistant Professor at the University of Waterloo.

Amrit L. Goel is Professor of Electrical and Computer Engineering and a member of the Computer and Information Science Faculty at Syracuse University. Dr. Goel’s current interests are in software reliability and testing, fault tolerant software, and performance modeling of parallel systems. He was recently elected a fellow of the IEEE for his contributions to the reliability of computer software.

Vaclav Rajlich is a professor and former chair of the Department of Computer Science at Wayne State University, Detroit, Michigan. Before that, he was an associate professor at the University of Michigan in Ann Arbor, and software manager at the Research Institute for Mathematical Machines in Prague, Czech Republic.

Marilyn Bush, an independent consultant, is one of the authors of the revised SEI Capability Maturity Model as well as an author of the SEI’s CMM Introductory Course and a qualified SEI Lead Assessor. She was recently a member of the SEI team asked to revamp the SEI Assessment Method and Lead Assessor Course, and she is a certified instructor for the SEI CMM Introductory Course and one of three people worldwide now certified to teach the SEI Lead Assessor Course.

**SESSION 6: MONDAY, 1–5 P.M.**

**Design Patterns for Object-Oriented Software Development**

*Wolfgang Pree, Hermann Sikora*

Design patterns support the development and reuse of extensible OO software components. They represent a complimentary enhancement of existing OO analysis and design (OOAD) methods. The tutorial will give an overview of state-of-the-art design patterns approaches, including pattern catalogs and framework patterns. A selection of useful patterns will be discussed in detail. The tutorial will also introduce hot spot cards, which have proved to be a useful communication vehicle between domain experts and software engineers in order to exploit the potential of design patterns.

**Formal Methods for Broadband and Multimedia Systems**

*Stefan Fischer, Stefan Leue*

Formal methods have been applied successfully to specify “traditional” communication protocols, services, and network applications. With high-speed networks, new distributed applications impose requirements on the communication subsystem that are different from those on traditional systems. To meet application-level performance requirements, highly efficient techniques to implement communication software have been developed. Formal description techniques (in particular, SDL and Estelle) can be used for the requirements specification, design, and implementation stages in the life-cycle of broadband communication systems.

**Software Engineering Data Analysis Techniques**

*Amrit Goel, Miyoung Shin*

During the past few years, there has been an increasing emphasis on the use of quantitative measures for monitoring and controlling software projects. As a result, collection of product and process data has become a standard practice in major software development organizations. While there has been a growing emphasis on the collection of metrics data, relatively very little work has been done on the systematic use of appropriate data analysis techniques. For metrics or measurement undertakings to be successful, we feel that it is essential to address both the data collection and analysis activities as mutually inseparable.

**Comprehension and Evolution of Legacy Software**

*Vaclav Rajlich*

Legacy systems have one or several of the following attributes: they were implemented many years ago, their technology became obsolete, their structure deteriorated, they represent a large investment, they contain business rules not recorded elsewhere, they cannot be easily replaced, or the original authors are not available. Software comprehension typically consumes more than a half of the difficult effort of maintaining legacy systems. The tutorial will give an overview of the available techniques and tools.

**European and American Software Process Maturity Models and Assessments**

*Marilyn Bush*

How do assessments generate increased productivity? How do software process assessments work? What principles underlie all current software process improvement models worldwide? Four major software process improvement models are on the international scene: ISO 9001 and 9000 3, Bootstrap, the SEI Capability Maturity Model (CMM) and Software Process Improvement and Capability Determination (SPICE). All these models acknowledge similar state of the practice principles of good software quality development process, but each involves a different take on assessing organizational process maturity.
TECHNICAL PROGRAM

TUESDAY, MAY 20, 1997

Morning

8:30–10:30 AM  SESSION 1
GRAND BALLROOM

1 OPENING SESSION AND KEYNOTE ADDRESS: Chairs: W. Richards Adrion, Anthony I. Wasserman Beyond Software Engineering Ed Yourdon

10:30–11:00 AM  BREAK

11:00 AM–12:30 PM  SESSION 2

2A TECHNICAL PAPERS: ICSE/SSR Joint Session
Chair: Mehdi Harandi
- Reuse Library Interoperability and the World Wide Web: Shirley E. Browne (University of Tennessee, USA); James W. Moore (Mitre Corporation, USA)
- Reuse of Off-Shelf Components in CS-Style Architectures: Yoel Medvidovic, Peyman Oreizy, Richard N. Taylor (Univ. of California at Irvine, USA)
- Configuring Designs for Reuse: Anssi Karhinen, Alexander Tan, Tapio Tallgren (Nokia Research Center, Finland)

2B TECHNICAL PAPERS: Exploiting the Internet
Chair: Alexander Wolf
- Anywhere, Anytime Code Inspections: Using the Web to Remove Inspection Bottlenecks in Large-Scale Software Development: James M. Perpich (Lucent Technologies, Inc., USA), Dewayne E. Perry (Bell Laboratories, USA), Adam A. Porter (University of Maryland, USA), Lawrence G. Votta, Jr. (Bell Laboratories, Lucent Technologies USA), Michael W. Wade (Lucent Technologies Inc., USA)
- Designing Distributed Applications with Mobile Code Paradigms: Antonio Carzaniga (Politecnico di Milano, Italy), Gian Pietro Picco (Politecnico di Torino, Italy), Giovanni Vigna (Politecnico di Milano, Italy)

2C LESSONS FROM ORGANIZATIONS: Object Technology
Chair: Don Batory
- Leveraging a Large Banking Organization to Object Technology: Werner Karbach, Joerg Noack, Hans-Bernd Kittlau (German Savings Bank Organization, Germany)
- Tailoring OMT for an Industry Software Project: Jeffrey Melanson (Siemens Medical Systems, USA), Robert L. Nord (Siemens Corporate Research, USA), Dilip Soni (Siemens Corporate Research, USA)

2D STATE OF THE ART REPORT: CASE: past, present, and future
David Notkin, (University of Washington, USA) Chair: Herrn Fischer

2E FORMAL RESEARCH DEMOS: Analysis
Chair: Laura K. Dillon
- Verification of Concurrent Software with FLAVERS: Gleb Naumovich, Lori A. Clarke, Leon J. Osterweil (University of Massachusetts, Amherst, USA), Matthew B. Dwyer (Kansas State University, USA)
- Nitpick, A Tool for Interactive Design Analysis: Craig Damon (Carnegie Mellon U., USA)

12:30 - 2:00 PM  LUNCH BREAK

Afternoon

2:00 - 3:30 PM  SESSION 3
COMMONWEALTH

3A TECHNICAL PAPERS: Formal Specifications
Chair: Richard Kemmerer
- An Object-Oriented Modeling Method for Algebraic Specifications in CafeOBJ: Shin Nakajima (NEC Corp., Japan), Kokichi Futatsugi (Japan Advanced Institute of Science & Technology, Japan)
- Formalizing and Integrating the Dynamic Model within OMT: Enoch Y. Wang, Heather A. Richter, Betty H. C. Cheng (Michigan State University, USA)
- Introducing Formal Specification Methods in Industrial Practice: Luciano Baresi, Alessandro Orso, Mauro Pazzè (Politecnico di Milano, Italy)

3B TECHNICAL PAPERS: Reliability
Chair: Adam Porter
- Choosing a Testing Method to Deliver Reliability: Phyllis Frankl (Polytechnic University, USA), Dick Hamlet (Portland State University, USA), Bev Littlewood (City University, U.K.), Lorenzo Strigini (City University, U.K.)
- Re-estimation of Software Reliability After Maintenance: Andy Podgurski (Case Western Reserve Univ., USA), Elaine J. Weyuker (AT&T Research Labs, USA)
- A Study on the Failure Intensity of Different Software Faults: Kazuyuki Shima, Shingo Takada, Ken’ichi Matsumoto, Koji Torii (Nara Institute of Science and Technology, Japan)

3C PANEL: Platforms for Software Execution: Databases vs. Operating Systems vs. Browsers
Chair: Richard Selby
Panelists: Paul Dorsey (Dulcian, Inc., USA), Jeff Anders (Sun Microsystems, USA), Larry Bernstein (Bell Labs, USA), Randy Davis (MIT, USA)

3D INVITED PRESENTATIONS: Large Systems Experience I
Chair: Jerry Fiddler
- How I Learned to Stop Worrying and Love the SESSI!, Eric Sumner, Rebecca Grinter, Lawrence G. Votta (Bell Laboratories, Lucent Technologies, USA)
- Architecting Families of Software Intensive Products, Alexander Ran (Nokia Research Center, USA), Hamish Kellock and Peter Hjort (Nokia Telecommunications, Finland)

3E FORMAL RESEARCH DEMOS: Software Evolution
Chair: William Griswold
- Endeavors: A Process System Infrastructure: Arthur S. Hitomi, Gregory Alan Bolcer, Richard N. Taylor (University of California, Irvine, USA)
- Argo: A Design Environment for Evolving Software
Architectures: Jason E. Robbins, David M. Hilbert, David F. Redmiles (University of California, Irvine, USA)

### 3:30-4:00PM
**BREAK**

### 4:00-5:00PM
**SESSION 4**

**COMMONWEALTH**

#### 4A
**TECHNICAL PAPERS: Inspections and Reviews**
Chair: Ross Jeffery
- *An Empirical Study of Communication in Code Inspections*<br>Carolyn B. Seaman, Victor R. Basili (University of Maryland, USA)
- *A Case Study of Distributed, Asynchronous Software Inspection:* Michael V. Stein, John Riedl (University of Minnesota, USA), Sören J. Harner (ICEM Systems, GMBH, Germany), Vahid Mashayekhi (DELL Computer Corp., USA)
- *Assessing software review meetings: A controlled experimental study using CSRS:* Adam A. Porter, Harvey P. Siy (University of Maryland, USA), Lawrence G. Votta (Bell Laboratories, Lucent Technologies, USA)
- *Understanding the Effects of Developer Activities on Inspection Intervals:* Harvey P. Siy, Adam Porter (University of Maryland, USA), Lawrence G. Votta (Bell Laboratories, Lucent Technologies, USA)

#### 4B
**TECHNICAL PAPERS: User Interface and Specifications**
Chair: Guillermo Arango
- *Early Specification of User-Interfaces: Toward a Formal Approach:* J.-P. Jacquot, D. Queznot (Centre de Recherche en Informatique de Nancy, France)
- *Automated Analysis of Requirement Specifications:* William M. Wilson (Software Assurance Technology Center/GSFC, USA), Linda H. Rosenberg (Unisys Federal Systems/GSFC, USA), Lawrence E. Hyatt (NASA/GSFC, USA)
- *Integrating Support for Temporal Media into an Architecture for Graphical User Interfaces:* T.C. Nicholas Graham, Tore Urnes (York University, Canada)
- *A Meta-Model for Restructuring Stakeholder Requirements:* William Robinson and Slav Volkov (Georgia State University, USA)

#### 4C
**TECHNICAL PAPERS AND EXPERIENCE REPORTS (ER): Legacy Systems and Testing**
Chair: Mary Jean Harold
- *Manipulating Recovered Software Architecture Views:* Alexander S. Yeh, David R. Harris, Melissa P. Chase (Mitre Corporation, USA)
- *Lessons on Converting Batch Systems to Support Interaction (ER):* Robert DeLine, Gregory Zeesnisk, Mary Shaw ( Carnegie Mellon University, USA)
- *Applying Design of Experiments to Software Testing (ER):* I. S. Dünieth, W. K. Ehrlich, B. D. Szabok (AT&T NCS OTC, USA), C. L. Mallows (AT&T Laboratories, USA), A. Linnam (Pipeline Associates, USA)
- *A Theory of Probabilistic Functional Testing:* Gilles Bernot (Université d’Evry, France), Laurent Bouaziz (CERMICS-ENPC, France), Pascale LeGall (Université d’Evry, France)

### 4D
**PANEL: Advantages of Maintaining a High CMM Level**
Chair: Marie Silverthorn
Panelists: Kelly Butler (Tinker AFB, USA), Bill Curtis (TeraQuest, USA), Mike Díaz (Motorola GED, USA), Jeff Perdue (ISPI, USA), Gary Wolf (Raytheon, USA), Alan Woody (Texas Instruments, USA)

### 6E
**FORMAL RESEARCH DEMOS:**
**Software Evolution and Maintenance**
Chair: Aniello Cimitile
- *Automatic Monitoring of Software Requirements,* Don Cohen, Martin S. Feather, K. Narayananswamy, Stephen S. Pickas (Computing Services Support Solutions, USA)
- *Preventive Program Maintenance in Demeter/Java,* Karl Lieberherr, Doug Orleans (Northeastern U., USA)

### Evening

### WEDNESDAY, MAY 21, 1997

#### Morning

**8:30 - 10:00AM**
**SESSION 5**

**GRAND BALLROOM**

#### 5
**KEYNOTE ADDRESS:** Java and the Evolution of Web Software
Guy Steele (Sun Microsystems, USA)
Chair: Richard N. Taylor

**10:00-10:30AM**
**BREAK**

**10:30AM - 12:00PM**
**SESSION 6**

**COMMONWEALTH**

#### 6A
**TECHNICAL PAPERS: Static Analysis**
Chair: Paola Inverardi
- *Analyzing Partially-Implemented Real-Time Systems:* George S. Avrunin (University of Massachusetts, USA), James C. Corbett (University of Hawaii, USA), Laura K. Dillon (University of California—Santa Barbara, USA)
- *Constructing Multi-Formalism Space-State Analysis Tools: Using Rules to Specify Dynamic Semantics of Models:* Mauro Pesce (Politecnico di Milano, Italy), Michal Young (Purdue University, USA)
- *Software Deviation Analysis:* Jon Damon Reese, Nancy G. Leveson (University of Washington, USA)

#### 6B
**TECHNICAL PAPERS: Metrics**
Chair: Lawrence G. Votta
- *A Predictive Metric Based on Discriminant Statistical Analysis:* Maurizio Pighin, Roberto Zamolo (Università degli Studi di Udine, Italy)
- *Communication Metrics for Software Development:* Bernd Bruegge, Allen H. Dutoit (Carnegie Mellon University, USA)
- *Characterizing and Modeling the Cost of Rework in a Library of Reusable Software Components:* Victor R. Basili (University of Maryland, USA), Steven E. Condon (CSC, USA), Khaled El Eman (FIESE, Germany), Robert B. Hendrick, Wakelio Melo (Centre de Recherche Informatique de Montral)

#### 6C
**STATE OF THE ART REPORT:** Everything You NEED to Know About Collaboration and Collaboration Software
Mark S. Ackerman (University of California, Irvine)
Chair: Jeffrey Kramer
TECHNICAL PROGRAM

GRAND BALLROOM

6D PANEL: Java Development Environments
Chair: Anthony I. Wasserman
Panelists: Jeff Anders (Sun Microsystems, USA), Peter Kellogg-Smith (Asymetrix, USA), Leo Lucas (Aimtech, USA), Laurent Visconti (Metrowerks, USA)

HAMPTON A/B

6E FORMAL RESEARCH DEMOS: Requirements
Chair: Sol Greenspan
- The SCR Method for Formally Specifying, Verifying, and Validating Requirements: Tool Support. Constance Heitmeyer, James Kirby, Jr., Bruce Labaw (Naval Research Lab, USA)
- GRAIL/KAOS: An Environment for Goal-Driven Requirements Engineering. Robert Darimont, Emmanuelle Delor, Philippe Massonet, Axel van Lansweerde (University Louvain, Belgium)

2:15 - 3:45 PM SESSION 8

3:45-4:15 PM BREAK

4:15-5:45 PM SESSION 9

9A TECHNICAL PAPERS: Process Improvement
Chair: Jean-Claude Demnaire
- Measuring Requirements Testing. Theodore Hammer (NASA Goddard Space Flight Center, USA), Linda H. Rosenberg (Unisys Federal Systems, USA), Lenore Huffman (SATC, USA), Lawrence E. Hyatt (NASA Goddard Space Flight Center, USA)
- Integrating Measurement with Improvement: An Action-Oriented Approach. Jo Ann Lane (Science Applications International Corporation, USA), David Zubrow (Carnegie Mellon University, USA)
- Total Software Process Model Evolution in EPOS. Minh N. Nguyen, Alf Inge Wang, Reidar Conradi (Norwegian University of Science & Technology, Norway)

12:00 - 1:15PM LUNCH BREAK

Afternoon

1:15 - 2:15 PM SESSION 7

7A TECHNICAL PAPERS AND EXPERIENCE REPORTS (ER): Process
Chair: Tatsuya Kitamura
- A New Software Project Simulator Based on Generalized Stochastic Petri-net: Shinji Kusumoto, Osamu Mizuno, Tohru Kikuno, Yuji Hirayama (Osaka University, Japan), Yasunari Takagi, Keishi Sakamoto (OMRON Corporation, Japan)
- The Criticality of Modeling Formalisms in Software Design Method Comparison (ER): Rodion M. Podorozhny, Leon Osterweil (University of Massachusetts, Amherst, USA)

COMMONWEALTH

7B TECHNICAL PAPERS: Hardware/Software Issues
Chair: Pankaj Jalote (Infosys Technologies, India)
- A Specification of Software Controlling a Discrete-Continuous Environment: Viktor Friesen, Stefan Jähnichen, Matthias Weber (Technische Universität Berlin, Germany)
- Automatic Checking of Instruction Specifications: Mary Fernández (AT&T Research, USA), Norman Ramsey (University of Virginia, USA)

INDEPENDENCE WEST

7C LESSONS FROM ORGANIZATIONS: Architecture Recovery and Reverse Engineering
Chair: David Garlan
- Software Architecture Recovery of Embedded Software: Wolfgang Eixelsberger, Lasse, Warholm (ABB Corporate Research, Norway), Rene Klösch, Harald Gall (Technical University of Vienna, Austria)
- Integrating Forward and Reverse Object-Oriented Software Engineering. Christoph Welsch (ABB Corporate Research, Germany), Alexander Schalk (Adtranz, Germany), Stefan Kramer (ABB Color Emag Schaltanlagen, Germany)

CONSTITUTION

7D INVITED PRESENTATION/LESSONS FROM ORGANIZATIONS: Large Systems Experience II
Chair: TBA
- Pragmatic Software Metrics for Iterative Development: Walker Royce (Rational Software, USA)
- The Windows 95 User Interface: Iterative Design and Problem Tracking in Action: Kent Sullivan (Microsoft Corporation, USA)
Chair: Michael Cusumano
- Prioritizing Software Requirements in an Industrial Setting: Kevin Ryan (University of Limerick, Ireland), Joachim Karlsson (Focal Point AB, Sweden)
- Lessons Learned with the Systems Security Engineering Capability Maturity Model: Rick Hefner (TRW, USA)
- BOOTSTRAP: Four Years of Assessment Experience: Franz Engelmann, Hans Stienen, Ernst Lebsanft (YNSPACE AG, Switzerland)

COMMONWEALTH
9D PANEL: Collaborative Software Engineering
Chair: Kanth Miriyala, Andersen Consulting
Panelists: Prasun Dewan (University of North Carolina, USA), Philip Johnson (University of Hawaii, USA), Remo Pareschi (Rank Xerox Research Centre, France)

9E • HAMPTON A/B
9E FORMAL RESEARCH DEMOS: Component Integration
Chair: Martin Wirsing
- ADE — An Architecture Design Environment for Component-Based Software Engineering: Jim Q. Ning (Andersen Consulting, USA)
- Package-Oriented Programming of Engineering Tools: Kevin J. Sullivan, Jake Cockrell, Shengtong Zhang, David Coppit (University of Virginia, USA)

5:45-6:30PM ACM/SIGSOFT OPEN MEETING
COMMONWEALTH
A meeting for SIGSOFT members and other interested parties

6:30 - 7:15PM IEEE-CS/TCSE OPEN MEETING
COMMONWEALTH
A meeting for TCSE members and other interested parties

Evening

Thursday, May 22, 1997
Morning

8:30 - 10:00AM SESSION 10
GRAND BALLROOM
10 KEYNOTE ADDRESS: Software Engineering That Matters to People
Mark Weiser (Xerox PARC, USA)
Chair: Alfonso Fuggetta

10:00-10:30AM BREAK
REPUBLIC FOYER

10:30AM - 12:00PM SESSION 11
GRAND BALLROOM
11A TECHNICAL PAPERS: Analysis of C & C++
Chair: Mauro Pezzè
- An Investigation into Coupling Measures for C++: Lionel Briand (IESE, Germany), Prem Devanbu (AT&T Research, USA), Walcelio Melo (CRIM, Canada)
- Incremental Analysis of Side Effects for C Software Systems: Jyh-shiarn Yur, Barbara G. Ryder (Rutgers University, USA), William A. Landi (Siemens Corporate Research, USA), Phil Stocks (Rutgers University, USA)
- Flow Insensitive C++ Pointers and Polymorphism Analysis and its Application to Slicing: Paolo Tonella, Giuliano Antoniol, Roberto Fiutem (IRST, Italy), Ettore Merlo (Ecole Polytechnique C.P., Canada)

INDEPENDENCE WEST
11B TECHNICAL PAPERS: Economic and Legal Issues
Chair: TBA
- The Effect of Department Size on Developer Attitudes to Prototyping: J. M. Verner (City University of Hong Kong, Hong Kong), N. Cerpa (University of New South Wales, Australia)
- Copyright in Shareware Software Distributed on the Internet — The Trumpet Winsock Case: Cristina Cifuentes (University of Queensland, Australia), Anne Fitzgerald (University of Tasmania, Australia)
- On the Economics of Mass-Marketed Software: Richard J. Bottig (California State University at San Bernadino, USA)

CONSTITUTION
11C STATE-OF-THE-ART REPORT: Software Architecture
Speaker: Dewayne E. Perry, (AT&T Bell Laboratories)
Chair: Richard N. Taylor

COMMONWEALTH
11D MINI-TUTORIAL: An Introduction to CORBA
Speaker: Richard Soley (Object Management Group, USA)
Chair: Will Tracz

HAMPTON A/B
11E FORMAL RESEARCH DEMOS: Environments
Chair: Barbara Lerner
- Developing Graphical SE Tools with PROGRES, Andy Schürr, Andreas J. Winter (University Aachen, Germany)
- TINA ACE: An Environment for Specifying, Developing and Generating TINA Services: Piergiorgio Bosco, Giovanni Martini, Corrado Moiso (CSELT, Italy)

12:00 - 1:30PM LUNCH BREAK

Afternoon

12A TECHNICAL PAPERS: Object-Oriented Technology
Chair: John McHugh
- Abstract Syntax from Concrete Syntax: David S. Wile (University of Southern California, USA)
- Open Implementation Design Guidelines: Gregor Kiczales, John Lamping, Cristina Videira Lopes, Chris Maeda, Anurag Mendhekar (Xerox Palo Alto Research Center, USA), Gail Murphy (University of British Columbia, Canada)
- Hooking into Object-Oriented Application Frameworks: Garry Froehlich, H. James Hoover, Ling Liu, Paul Sorenson (University of Alberta, Canada)

CONSTITUTION
12B TECHNICAL PAPERS AND EXPERIENCE REPORTS (ER): Testing & Analysis
Chair: Kokichi Futatsugi
- Using Formal Methods to Reason about Architectural Standards: Kevin J. Sullivan (University of Virginia, USA),
John Socha (Socha Computing Inc., USA), Mark Marchukov
• Model-Checking of Real-Time Systems: A Telecommunications Application (ER): Rajeev Alur, Lalita Jategaonkar Jagadeesan (Bell Laboratories, USA), Joseph J. Kott, James E. Von Öhnapause (Lucent Technologies, USA)
• Specification-based Testing of Reactive Software: Tools and Experiments (ER): Lalita Jategaonkar Jagadeesan (Bell Laboratories, USA), Adam Porter (University of Maryland at College Park, USA), Carlos Puchol (The University of Texas at Austin, USA), J. Christopher Ramming (AT&T Laboratories, USA), Lawrence G. Votta (Bell Laboratories, USA)

Donald Kenneth has revised Volumes 1-3 of his timeless work, The Art of Computer Programming. Please stop by to add your name to the UML mailing list and receive information about the UML series by &The Three Amigos& Grady Booch, Ivar Jacobson and Jim Rumbaugh to be published later this year. The soon-to-be published CD version of the Design Patterns book by Gamma, et al., will be demonstrated. Other new titles of note are Software Reuse by Ivar Jacobson, Martin Griss and Patrik Johnson, Measuring Software Reuse by Jeffrey Poulin, Software Engineering By Ian Sommerville, Analysis Patterns by Martin Fowler, and Computer Architecture by Gerrit Blaauw and Fred Brooks. Also see the highly acclaimed SEI series and the Java Series, the only books authorized by JavaSoft, and the latest from Watts S. Humphrey, Ira Pohl, Grady Booch, and many others.

Addisson-Wesley Booth 5

Donald Kenneth has revised Volumes 1-3 of his timeless work, The Art of Computer Programming. Please stop by to add your name to the UML mailing list and receive information about the UML series by &The Three Amigos& Grady Booch, Ivar Jacobson and Jim Rumbaugh to be published later this year. The soon-to-be published CD version of the Design Patterns book by Gamma, et al., will be demonstrated. Other new titles of note are Software Reuse by Ivar Jacobson, Martin Griss and Patrik Johnson, Measuring Software Reuse by Jeffrey Poulin, Software Engineering By Ian Sommerville, Analysis Patterns by Martin Fowler, and Computer Architecture by Gerrit Blaauw and Fred Brooks. Also see the highly acclaimed SEI series and the Java Series, the only books authorized by JavaSoft, and the latest from Watts S. Humphrey, Ira Pohl, Grady Booch, and many others.

Elsevier Science Booth 8

Visit the Elsevier Science booth to see the latest publications in the field of software development and information processing; the launch of Abstracts Direct and Contents Direct of the journal Information and Software Technology; and to meet Doutzen Abma, Publishing Editor and Anna Ypma, Marketing Communications Manager, who are looking forward to meeting you.

Extended Intelligence, Inc. Booth 11

RPM is a process manager for supporting OO, C/S and Internet reuse-based business application development. Based on Reuse Engineering, it defines the steps needed to develop systems from Reusable models; metrics identify components of greatest value.

IFAD Booth 9

IFAD is a high technology company with research, development and sales of tools, consultancy and courses as central activities. Among our products are VDM-SL and VDM++ Toolboxes and VDM-SLtoC++ and VDM++toC++ Code Generators.

Kluwer Academic Publishers Booth 3

20% discount available on all books on display! Pick up a free sample copy of Empirical Software Engineering and/or Automated Software Engineering.

Neuma Technology Corp Booth 14

Neuma Technology Corporation is a world leader in the development of large-scale software development management systems. The company’s flagship product, NeumaCM+ provides automated configuration, data and process management and operates in UNIX and Windows/NT environments. The integrated applications of NeumaCM+ include: Source and Version Control, Configuration Management, Build and Release Support, Problem Tracking and Activity Tracking.

Technical Program

12C Lessons from Organizations: Process Issues
Chair: Elliot Chikofsky
• Code Reviews Enhance Software Quality: Richard A. Baker, Jr. (Schneider Automation Inc., USA)
• Implementing Cleanroom Software Engineering into Mature CMM-Based Software Organizations: Robert Oshana (Texas Instruments, USA), Frank P. Coyle (Southern Methodist University, USA)

13 Panel: Closing Remarks
Conference ends at 4:30 p.m.
INFORMAL RESEARCH DEMONSTRATIONS

HOURS: TUESDAY 11 AM - 5:30 PM
WEDNESDAY 11 AM - 5:30 PM
INDEPENDENCE EAST

• AGCS, Inc., USA
• Andersen Consulting, USA
• Brown University, USA
• Carnegie Mellon University, USA
• Computing Services Support Solutions, USA
• CSELT, Italy
• The Foxboro Company, USA
• Hughes Technical Services and Area Systems, Inc., USA
• Naval Research Lab, USA
• Northeastern University, USA
• University Aachen, Germany
• University of California, Irvine, USA
• University Louvain, Belgium
• University of Massachusetts & Flinders University, Australia
• University of Massachusetts & Kansas State University, USA
• University of Texas, Arlington, USA
• University of Victoria, Canada
• University of Virginia, USA
Conference Committee

General Chair
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Since ICSE’s founding, politics and technology have converged to shatter once formidable barriers to international cooperation. The collapse of the Berlin Wall symbolizes the end of the Cold War, and links in a Web page are a metaphor for our enhanced capacity for global information exchange.

In this spirit, we have worked hard to ensure that ICSE 98 will see an unprecedented increase in the level of international participation. In particular, we will give a greater voice to members from the Asian-Pacific region, an area under-represented in the past. Yet our outreach must extend beyond geography.

As we continue to build bridges to other software disciplines, researchers and practitioners in allied fields will benefit from an understanding of the contributions that software engineering can make to their work. In turn, we must address their problems in our research. New collaborations between academia and industry will also enrich ICSE 98 and our profession as a whole.

I hope you will take advantage of this unique opportunity to meet new colleagues, exchange ideas, and explore the nearly limitless possibilities that lie ahead. Join me in Kyoto for ICSE 98 and share the excitement that comes from forging new links.

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ICSE99

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