Reliability Society Newsletter

Editors: Gary Kushner and Mark Snyder

Vol. 36, No. 4, October 1990 (USPS 460-220)

President's Message

It is my pleasure to announce the establishment of the Academic Education Committee with Dr. John Hadjilogiou as its Chairman. This installation was consummated at the ADCOM meeting in Baltimore on July 20, 1990 and is the culmination of an idea initiated by Dr. Thaddeus Regulinski, ADCOM member and Senior Editor of our *Transactions*. We are indebted to both of these men, for the concept and for the willingness to serve the academic community and the Reliability Society. This action is part of the long-range objectives of our society: education for the working engineer. You are watching our society branch out and helping to present Reliability and Maintainability as a necessary part of the education of our engineering students. A detailed list of the objectives of this committee is listed separately.

The International Reliability of Physics Symposium, held in New Orleans in April, was a success with over 600 attendees. There were many good papers and exhibits. By this time, you have received your copy of the proceedings and realize the hard work that went into its formation. Our society was one of the co-sponsors.

I recently attended the meeting of the Technical Activities Board (TAB) of the IEEE in Seattle. Many subjects were discussed, but some of the most interesting were the move toward electronic publishing to reduce costs, the development of disk storage for transactions, and the need for IEEE headquarters to cut expenses. Expenses are rising and income is not keeping up.

In June, Paul Gottfreid, our VP of publications, attended The 10th Annual Japanese Reliability and Maintainability Symposium in Tokyo as our official representative. We are doubly fortunate since Paul's wife is Japanese and therefore acted as his interpreter. One of Paul's objectives was to discuss the implementation of reliability concepts into their products. We all know how successful they have been! A special meeting was held with working Japanese engineers for our benefit and is reported separately by Paul. We certainly were fortunate for this opportunity—thanks Paul.

Installation of Dr. John Hadjilogiou as chairman of the Academic Education Committee (left to right, Dr. Thaddeus T. R. Regulinski; Dr. John Hadjilogiou, Chairman, Bernhard Bang, President.

I also want to take this opportunity to thank Mike Pecht, Editor of our *Transactions*, and his fine crew of assistants in helping to produce our fine transactions. Have you noticed the increase in "practical" papers. This is something we have been working for. Thanks men, it wasn't easy!

RS Newsletter Inputs

All RS Newsletter inputs should be sent to one of the associate editors, **Gary Kushner** or **Mark Snyder**, per the following schedule:

For January Newsletter:	by Oct. 25
For April Newsletter:	by Jan. 25
For July Newsletter:	by Apr. 25
For October Newsletter:	by July 25

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Reliability Society Newsletter is published quarterly by the Reliability Society of the Institute of Electrical and Electronic Engineers, Inc. Headquarters: 345 East 47th Street, New York, NY 10017. Sent at a cost of $1.00 per year to each member of the Reliability Society. Printed in U.S.A. Second class postage paid at New York, NY and at additional mailing offices. Postmaster: Send changes to Reliability Society Newsletter, IEEE, 445 Hoes Lane, Piscataway, NJ 08854.

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Congratulations

Award
of the
International Reliability Physics Symposium
to
Alfred L. Tamburrino

28 March, 1990
New Orleans, Louisiana

Laudation

For only the fifth time in its 28 year history, the International Reliability Physics Symposium has elected an outstanding researcher to receive its Award. Mr. Alfred L. Tamburrino has been cited for his superb "Leadership in Reliability Physics and his numerous contributions to electronics reliability."

Mr. Tamburrino, Assistant Division Chief of the Microelectronics Division, Reliability and Compatiblity Directorate, RADC, was a cofounder in 1962 of the IRPS, then known as the Physics of Failure in Electronics Symposium. At the 1963 Symposium, he discussed the "Analysis of Requirements in Reliability Physics," (Proceedings Vol.2, pp. 1-24) – certainly advanced thinking for the year 1962! Several other "firsts" followed, many of them documented in the IRPS Proceedings. In 1970, Mr. Tamburrino coauthored a comprehensive overview of plastic reliability at IRPS in a paper titled "Can Plastic Encapsulated Microcircuits Provide Reliability with Economy?" (The answer was "no".)

As a matter of fact, Mr. Tamburrino was a trailblazer already at the time of his Master thesis in Physics (from the University of Pittsburg in 1961); the topic "Measurement of Circular Polarization of Gammas from the Beta Decay of Co-60" was one of the early experiments showing nonconservation of parity in weak interactions.

At RADC, Mr. Tamburrino dedicated his profound knowledge and rich experience to deeper understanding of failure mechanisms in silicon and GaAs devices, including electromigration, hot-carrier effects, electrical test and characterization, VHSIC reliability and VHSIC testing, design rules for reliability, and failure analysis techniques.

At the Reliability Physics Symposium, Mr. Tamburrino served as Secretary, Technical Program Chairman, General Chairman (1977), and member of the Board of Directors. Among his numerous functions were positions with the International Symposium on Testing and Failure Analysis, Electronic Components Conference, and Government Microcircuit Applications Conference.

Academic Education Committee

We would like to announce that on July 21, 1990, the IEEE Reliability Society established the *Academic Education Committee*, to be chaired by Dr. John Hadjilogiou, Department Head of the Electrical and Computer Engineering Department at Florida Institute of Technology. This is part of a long-range plan to make education a major part of the objectives of the Reliability Society.

The objectives of this committee are as follows:

1. To serve as an interface between the IEEE Reliability Society and the academia in matters pertaining to reliability education, training, and accreditation.
2. To be a focal point of educational information and a source for its dissemination to the members of the academic community seeking professional growth in reliability and its related disciplines.
3. To be an evaluating and accrediting source for the granting of Continuing Education Credits (CEU's) of reliability short courses, workshops, and seminars.
4. To sponsor, assist, organize, or conduct reliability educational or training courses, workshops, and seminars aimed at the academic community.
5. To nominate or to evaluate nominations for the Reliability Society educational medal, and for the Congressional Fellow Program.
6. To provide a focus/center of coordination for activities of those members of the academia who have been sponsored by the Reliability Society to participate in the professional educational functions.

As you can see from the above, this will be a very challenging and rewarding experience and we would welcome any help or suggestions you might afford us. This is an excellent opportunity for all of us to show our creativity and initiative.

For the success of this committee, we welcome any recommendations or suggestions. We have a few openings still available for anyone willing to serve on this committee. Our contact chairman is:

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Chapter News

Dallas

The Dallas Chapter has been in operation for about 18 months. During this time, local society membership has grown from 49 to 81 people. Ten meetings have been held where presentations covered current Reliability subjects such as "R&M and Computer Aided Engineering," "AVIP," R&M Warranties," and "Software Reliability." Attendance has been high. Our last meeting was held in April 1990 with its technical presentation being "Applications of Real-Time X-Radiography in Failure Analysis."

The membership committee is working to expand active membership to cover more companies in the Dallas area. Points of contact within companies in the Dallas–Fort Worth area are needed to help both in communicating chapter activities and in increasing membership. If you are in the Dallas area, please get involved. Your help and support is needed in making your Reliability Society a viable entity in the Dallas section.

Los Angeles

The following technical presentations were held:

- April—Dwight Borses of National Semiconductor spoke on Futurebus.
- May—Dan Binder formerly of Hughes and Mark Kaczmarek of TRW spoke on Satellite Vulnerability and Radiation Effects vs. Electronics.
- June—Chuck Cole of Transcal spoke on and conducted a tour of the Los Angeles Metro Rail Control Room. Rides on the Metro Rail were also included.
- July—Mark Gibbel of Gibbel Corp. spoke on The Awful Truth about Thermal Analysis and Its Effects on Reliability.

Upcoming presentations were:

- August—Diana Nicholson of TRW and John Fialko of Hughes Aircraft Co. will speak on Concurrent Engineering.
- September—Dave Franklin of Hughes Aircraft Co. will conduct a panel discussion on ASIC/VHSIC—Current Technology and the Future Plans.

The chapter operated bulletin board is expanding. We offer information about the chapter including: monthly technical

meetings, the video tape exchange program, listing of officers, job listings, electronic mail, shareware programs, Reliability Prediction Software demos, and the Open Forum (an exchange of ideas, comments etc.). Access the bulletin board with a 300-2400 baud modem at (818) 768-7644.

Denver

1.) Our meeting on June 22nd featured Dr. Sam Keene of IBM-Boulder discussing ''Integrated Software Modeling.'' This ''how to'' presentation emphasized high-level practical modeling for effective use by software product designers and managers to produce reliable software. Sam's presentation was followed by a tour of StorageTek's product line. Approximately 30 individuals representing a host of front-range companies attended. Thanks to Sam for presenting and to StorageTek for hosting the meeting.

2.) On Friday, July 27th, Mr. John Hallan, Director of Ethics and Corporate Effectiveness, at Martin Marietta will discuss many aspects of the relationship among quality, ethics, and corporate effectiveness. Some questions John will address are: ''How do you raise the level of truth and reduce the level of fear in an organization?'' and ''How do we build community in the workplace?.''

Answers to these questions bear directly on the success of all of our companies. Mr. Hallen was recently interviewed in the Rocky Mountain News. Following are quotes by Mr. Hallen from that interview: ''If quality assurance is nothing more than an efficiency strategy, all you do is raise the level of stress within an organization...'' and ''Quality control really begins with communication.''

Washington/Northern Virginia

The Washington/Northern Virginia Chapter has elected new officers to serve for the period from July 1, 1990 through June 30, 1991. They are:

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Society members who plan to travel to the Washington, DC area are cordially invited to join us in chapter activities that are occurring during your stay in the area. The Chapter usually meets every month except July and August on the Wednesday closest the middle of the month. Contact any chapter officer for more accurate information when you know when you will be in town.

Boston

This year the Boston Section has planned a full roster of activities. Monthly dinner meetings started in September with Gene Bridgers, of CODEX, presenting the differences that Notice 1 of MIL-HDBK-217E brings to reliability prediction. The meeting went smoothly with a great deal of interest generated. Gene is also heading up the chapter's technology development workshops this year, which focus on providing solutions to particular problems or issues facing the membership. One product of these workshops is an integrated circuit database for reliability prediction, which we plan to greatly enhance during the coming year. We are preparing for our fall lecture series with the title of the series being ''Total Quality Management.'' The speakers for this series of lectures are Mary Ann Russo, Bill Koury, and Mark Snyder, all of Digital Equipment Corporation. The dates for the lectures are October 25, November 1, 8, and 15.

Cleveland

The Cleveland Chapter had one good meeting and received an award during this reporting period.

1. Our 6th meeting was on rapid development of software. This meeting was from the IEEE Learning Channel Video Conference Seminars via satellite. Three experts...Dr. Robert Balzer, Dr. David Barstow and Dr. Ted Biggerstaff talked about:

- The Software Problem—Underlying Causes,
- Defining and Supporting a New Software Paradigm,
- Achieving Feasibility through Scope Narrowing,
- Practical Rapid Software Development Technologies,

This meeting was well attended and enjoyed by all.

2. Our Chapter Chairman, V. R. Lalli, was honored as Engineer of the Year by Cleveland Engineers, (see article that follows). Mr. Lalli was nominated and elected as Vice chairperson of the Cleveland Section.

All in all here in Cleveland we are having fun serving our members and look forward to expanded activities in the future.

Congratulations

Vincent Lalli Honored As Engineer Of The Year During Cleveland Engineers Week Banquet

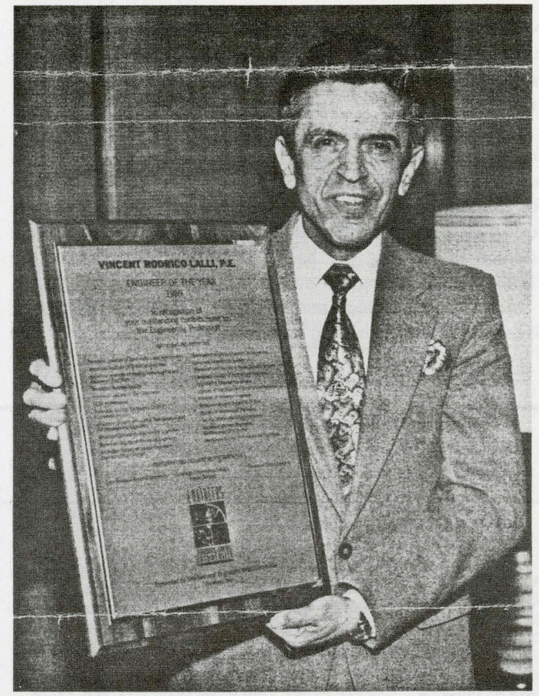
Vincent Lalli, a product assurance manager in the Safety Assurance Office, was named Engineer of the Year during a banquet Feb. 24 to celebrate National Engineers Week in Cleveland. The banquet was sponsored by the Cleveland-area chapters of 21 engineering societies. Center Director Dr. John Klineberg was the keynote speaker.

Lalli was nominated for the award by the Cleveland Section of the Institute of Electrical and Electronic Engineers (IEEE) for his significant contributions in reliability physics at NASA and his valuable service to IEEE.

At Lewis, Lalli is responsible for assuring the reliability of sophisticated electronic hardware and software, such as the experimental flight system of the Advanced Communications Technology Satellite (ACTS). Lalli is currently evaluating the reliability of the Space Acceleration Measurement System (SAMS), an instrument to be used aboard the space shuttle to measure the gravitational forces on experiments conducted in space.

During his 29 years at Lewis, Lalli has written 45 technical papers, received one patent, earned six group achievement awards, served on numerous committees, and taught courses at Case Western Reserve and Cleveland State Universities. He is currently a member of the Lewis Speakers Bureau.

Lalli has been actively involved in IEEE since 1951 and was named a senior member in 1980. As chairman of the Membership Development Group in IEEE's Reliability Society, Lalli co-authored a ''Reliability Home Study Course for the Engineer'' that has been used by more than 1500 engineers, technicians, and students.



Vince Lalli, of the Safety Assurance Office, displays the Engineer of the Year award he received during the Cleveland area's Engineers Week Banquet Feb. 24. He was nominated for the award by the Cleveland Section of the Institute of Electrical and Electronics Engineers.

RS ADCOM Election Results

Congratulations to the following members who were elected to the three year term expiring December 31, 1993:

Dale Butler
Richard Doyle
Joseph Gruessing
Howard Kennedy
Thad Regulinski
Marvin Roush

RS Member Named Professor Emeritus at New Jersey Institute of Technology

NEWARK—Raj P. Misra of West Caldwell has been appointed professor emeritus of electrical engineering at New Jersey Institute of Technology in recognition of his 28 years of service.

A specialist in electronic reliability, Misra joined the NJIT faculty as an electrical engineering professor in 1962. In 1986, he was appointed assistant vice president for academic affairs for evening programs. Until his retirement in May, he also served as director of the Center for Reliability Research. In addition to teaching, he has served as a consultant to the United States government and to private industry.

Misra was selected in 1982 by the U.S. Academy of Sciences to participate in an exchange program with the Romanian Science Academy. He spent six weeks in Romania speaking with industry representatives and university faculty.

A senior member of the Institute of Electrical and Electronics Engineers and the American Society of Engineering Education, Misra also is a member of the British Institute of Electrical Engineers, the Indian Institute of Engineers, the American Society for Quality Control and the Societe Francaise des Ingenieurs Technicans Du Vide. Misra has published over 50 papers and articles, primarily in the area of reliability.

Misra earned a bachelor's degree in electrical engineering from Massachusetts Institute of Technology and a masters degree in electrical engineering and a doctorate in physical electronics from Cornell University.

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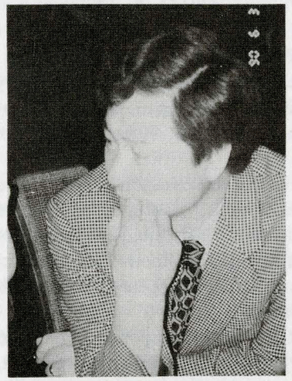
Reliability Education In Japan

Paul Gottfried
Vice President—Publications

On June 3, my wife/interpreter and I met with the officers of the Tokyo Chapter in advance of the 1990 International Symposium on Reliability & Maintainability (see report elsewhere in this issue). The Chairman is Prof. Masayoshi Furuya of Tokyo Denki University; the Vice Chairman, Prof. Yoshihisa Suzuki of the Tokyo Metropolitan Institute of Technology; and the Secretary/Treasurer, Assoc. Prof. Shoshiro Hatakeyama, also of Tokyo Denki University. Since all three are educators, this meeting also provided an opportunity to discuss the structure of reliability education in Japan.

P. Gottfried, K. Gottfried, Y. Suzuki, M. Furuya

Unlike the U.S., Japan has no degree programs in reliability at either bachelor's or postgraduate levels. There are elective lectures (courses?), which cover only the basics and don't attract much interest. There are many short courses, in-house and otherwise, with instructors typically drawn from the universities, and of course there is on-the-job training. In addition, there are many books for independent study at all levels.



S. Hatakeyama

In addition to the three chapter officers, I met (at the Symposium) professors from several other universities and institutions. All of these were active participants in professional societies with reliability orientation—if not the IEEE Reliability Society, then the Reliability Engineers Association of Japan (REAJ), which has some 600 members. Almost all of these members of the academic community had come from industry or government.

To me, Japanese products and publications make it clear that both practical and theoretical aspects of reliability are being *learned*—regardless of whether (or how) they are being *taught*.

Continued from previous page.

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Some Notes on Reliability Engineering in Japan

Paul Gottfried
Vice President—Publications

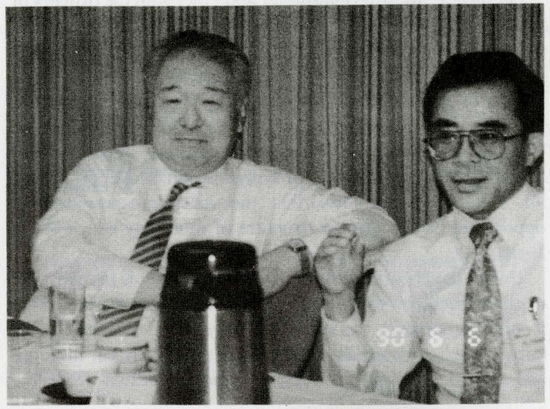
Early in June, the 1990 International Symposium on Reliability & Maintainability was held in Tokyo. I was due to visit Japan anyway (my wife is Japanese), so I volunteered to represent the Reliability Society—our Tokyo chapter was among the Symposium's supporters, the sponsor being the Union of Japanese Scientists and Engineers (JSUE—despite its name, is an association of Japanese companies that is under the jurisdiction of Japan's Science and Technology Agency). This innocent act quickly led to two assignments: to deliver, at the banquet, a message of greetings from President Bernhard Bang and, at his request, to try to find out why Japanese reliability engineers seem to have so much more successful results than the rest of us.

This is a report on the second assignment, but first a few words on the Symposium (also known as ISRM'90). Attendance was about 600 Japanese and 50 ''foreigners,'' the latter including such notables as Dr. Leslie Ball (one of the few active reliability practitioners to predate me); Prof. Michael Pecht, Editor of our *Transactions*; Dr. George Rodney, Associate Administrator of NASA; and Kjell Strandberg, Secretary of IEC TC 56. Simultaneous English/Japanese translation was available for all sessions, and the symposium proceedings were in English (unfortunately, no extra copies are available). The meeting facilities of Keidanren Kaikan were used.

Tokyo Chapter Chairman Prof. Masayoshi Furuya was instrumental in enabling me to carry out my second assignment. He introduced me to more people than I could count; arranged a personalized tour of Hitachi's computer development and assembly facility at Odawara; and, most importantly, set up a 2.5-hour round-table discussion with working-level reliability personnel. (With the cooperation of JUSE and the Symposium management, this discussion was set up as an after-hours ''sub-meeting'' in the Keidanren Kaikan facilities.)

Previous reading and comments had led me to expect differences in organization and assignment of responsibilities for reliability in Japan, as compared to the West. This led me to structure the sub-meeting and other discussions around the following questions:

- In a Japanese manufacturing company, is the reliability engineer's job separate, or is reliability the designer's job?
- If it is a separate job, where is the reliability engineer placed in the organization?
- Also, if the job is separate, how often do reliability engineers interact with designers? With manufacturing engineers?
- How is feedback from the customer channeled back to the right people?



M. Furuya, K. Yamazaki

- When, for example, an American transit authority buys Japanese railcars, they demand a lot of military-style analysis and documentation. Do Japanese manufacturers do similar things for other customers? If not, what do other customers ask for?

(I should note that those responding to these questions were, with a few exceptions, associated with the electronics and electrical industries. It is possible that the response would have been different if, e.g., automotive engineers had been asked. In fact, some differences appeared between device and end-item manufacturers.)

The almost unanimous response to the first question was that reliability exists as a separate function, although the designer has responsibility for taking reliability into account. In some cases, the separate function is called ''product assurance'' and is, not surprisingly, a mix of reliability and quality assurance and testing. In other words, reliability, though viewed as a design characteristic, is subject to review and analysis by others. Whether reliability is separate or not thus is in part an issue of semantics. The fact is that someone is looking over the designer's shoulder, perhaps at a distance. (A parallel question, asked in factories, revealed the general use of inspectors at discrete steps in the manufacturing process—regardless of whether the process was manual or robotic—in contradiction of prevailing folklore.) I fail to detect any substantial difference from typical U.S. practice.

The organizational structures described were generally of the ''functional'' or ''matrix'' variety. However, it is not unusual to find that the product- or project-manager dimension of the matrix carries more power (or attracts the more forceful individuals), ''consensus'' folklore notwithstanding. (Interestingly, this point was emphasized by the younger participants in the sub-meeting, in fairly noisy disagreement with their elders.)

K. Yamazaki, K. Nikawa, A. Masuda, K. Onodera

The interaction among design, reliability, and manufacturing engineers was described as virtually continuous; it seems that social and organizational barriers don't exist, on the job or in the famous Japanese after-working-hours activities. Many respondents also gave credit to the Japanese workforce's homogeneity. In a somewhat related area, there was pointed out a side effect of Japan's tradition of lifetime employment: supervisor and subordinate both realize that they have to get along with each other, because quitting and firing are not readily available solutions to friction.

Feedback from customers normally arrives via sales/marketing, and from there through product assurance. Nothing else was very different—except I think maybe another aspect of lifetime employment: the responsible parties must expect to still be around when the feedback arrives (avoiding the ''it didn't happen on my watch'' syndrome).

The response to the fifth question was basically that virtually nobody else requires as much, or as formal, paperwork; the emphasis in Japan is on long-term relationships and on trust built on these relationships, and it was suggested that the U.S. ought to modify the extreme arms-length posture used in government procurements. I thought it necessary to point out that in the U.S. it is illegal for the government to trust anybody.

To summarize what I heard:

- Outsiders tend to think of Japan as being not only homogeneous, but monolithic—to think that every Japanese company resembles all the others. In reality, there are differences related to product level (parts vs. systems) and to company history, as well as to plain, ordinary differences in ideas among individuals.
- By and large, at least with respect to reliability, what Japanese companies do and how they organize themselves to do it does not differ greatly from Western practices.

If there is a difference, it is that the Japanese do the same things better. It is currently fashionable to attribute this to the work ethic, to education, to cultural peculiarities, to a more favorable ratio of engineers to lawyers, or to an economic/ownership structure that permits management to take the long view. Personally, I think the reason is ''all of the above''—but especially the last. (I also suspect that in 20 years, as their values continue to become more Westernized, the Japanese will face the same challenges from the ''NICs'' [newly industrialized countries] that the West today faces from Japan.)

To put it another way: I think we can gain a great deal by striving to emulate Japanese attitudes; I think we gain nothing by faddish attempts to transplant what we think are Japanese methods.

I am indebted, beyond any hope of repayment, to Professor Furuya for all his efforts. I am also indebted, for their generous contribution of time and effort, to the other participants in the sub-meeting: Mr. Kazumi Inoue, Mitsubishi Semiconductor Div.; Mr. Akihiko Masuda, NEC Microwave & Satellite Comm.; Mr. Toshihisa Masuda, TV Research Labs., Japanese Victor; Mr. Kiyoshi Nikawa, NEC System LSI Development; Mr. Wataru Ohtsu, Consultant (formerly of Fujitsu); Mr. Hideo Okamoto, Oki Engineering; Mr. Katsuhige Onodera, Hitachi Nuclear Power Systems; Prof. Yoshihisa Suzuki, Tokyo Metropolitan Inst. of Tech.; Mr. Kensuke Yamazaki, Musashi Works, Hitachi.

I cannot name all the others, at the Symposium and in the plants I visited, who also contributed to this educational experience.

Dr. Noboru Takagi—Co-Chairman, ISRM 90 Organizing Committee; President, Tokyo Engineering University; Past Chairman, Tokyo Chapter

Any of the preceding, named or unnamed, who feels that I have misunderstood or misrepresented his views or have done injustice to Japanese industry is invited to submit his comments or rebuttal to the *Newsletter*. For that matter: anyone at all who has experience and/or strong views on the subject should feel free to contact the *Newsletter* if he wishes to make his remarks public, or me if he wants to comment privately. (The use of the masculine pronoun throughout is intended to be conventional, not sexist.)

(clockwise) A. Masuda, K. Onodera, T. Masuda, Y. Suzuki, H. Okamoto, P. Gottfried, K. Gottfried

SoHaR Receives Federal Award

SoHaR Incorporated has received the "Region IX Prime Contractor of the Year" award. The presentation was made today by Mr. Oscar Wright, Regional Administrator of the Small Business Administration. SoHaR was nominated for the award by the USAF Rome Air Development Center for developing a technique that finds design faults in electronic circuits. The technique, called sneak circuit analysis, has traditionally been conducted by specialist teams that looked for suspect patterns of electrical connections and then studied these in detail. The improvements pioneered by SoHaR make it possible for non-specialist designers to carry out sneak circuit analysis with the aid of a personal computer. SoHaR presented a paper on this work at the 1990 RAMS.

SoHaR Incorporated specializes in the design and analysis of digital systems for applications in which a failure can affect human safety or cause very large economic losses. The company name is derived from Software and Hardware Reliability. Activities include research in reliability modeling and fault tolerance, development of highly fault tolerant systems, and helping government agencies and larger companies in the development of major systems that require continuously available computers.

SoHaR has previously been cited by the FAA for its contributions to the development of a new air traffic control system, called the Advanced Automation System (AAS). It has also been commended by the Nuclear Regulatory Commission for its work in auditing software development for nuclear power plants. Other major clients include the Department of Energy (for computers serving nuclear installations) and the

Mr. Oscar Wright, U.S. Small Business Administrator for Region IX (center) presents award to Dr. Herbert Hecht (left) and Myron Hecht of SoHaR.

Department of Defense, primarily for aerospace applications of computers. The company has also supported local aerospace prime contractors and has received a number of Small Business Innovation Research contracts.

SoHaR was founded in 1978 by Dr. Herbert Hecht and his son Myron Hecht who are now President and Vice President, respectively. The company has offices in the Los Angeles and Washington metropolitan areas. It has fifteen employees. Dr. Hecht as well as 2 staff members (i.e., 20% of the technical staff) are members of the Reliability Society.

Software Reliability Engineering Subcommittee

Yashwant K. Malaiya

Colorado State University

Software has now emerged as the major factor affecting computational reliability. Today software reliability is of critical concern in not only defense, aerospace and telephone switching but also in commercial applications like data-base management, networking and even spreadsheets. As compared with hardware reliability, software reliability is harder to characterize because the software faults are "man- made". The measurement of software reliability has been under investigation at organizations like AT&T and Hewlett-Packard. Efforts of researchers like John Musa (AT&T) have led to some compilation and analysis of data.

With the increased understanding of the problems and emergence of possible solutions, need was felt to organize a forum to promote exchange of ideas in this field. With the initiative of Frank Ackerman (Institute for Zero Defect Software, IZDSW), Mike Lyu (JPL) and Val Nereo (HP), the Software Reliability Engineering Subcommittee has been formed as a part of the Technical Committee on Software Engineering. The objective of the Subcommittee is to coordinate and facilitate the exploration and application of both current and emerging techniques in this field. The technical scope includes measurement of software reliability, quantitative studies of the factors affecting it as well as approaches to control these factors.

The Subcommittee's kick-off meeting was held recently during April 12 - 13, 1990 in Washington, D.C.. It was attended by more than 150 persons from both the United States and overseas. These included major researchers from both industry and universities. Organized by Frank Ackerman, Mike Lyu and Val Nereo, the sessions included presentations and discussions of technical and organizational issues. The meeting was sponsored by IEEE, and was hosted by NASA, HP, AT&T and IZDSW.

Several presentations discussed comparisons and applications of software reliability growth models. The exponential model with its several variations is the most common model. In some cases, the delayed S-shaped model with correction for imperfect debugging, may be a better choice. An approach for evaluation short-term predictability of different models was presented. It was shown that an adaptive approach can significantly improve predictability of several models. Modeling by using a compound Poisson process was also discussed. The effects of fault clustering on reliability growth acceleration was pointed out.

While faults in software and hardware generally occur due to completely different factors, both need to be considered to evaluate the overall reliability. A reliability estimation approach was presented that took into account the fault

tolerance implemented in both hardware and software. A simulation approach was discussed, which may be used to generate simulated dynamic test-data with chosen parameter values. The weakness of conclusions for static program metric correlations, in absence of sufficient data was pointed out.

Approaches taken at major corporations as well as space programs were discussed. The objectives of AIAA SBOS-COS, a committee to promote cooperation and standards for space mission reliability, were presented. A limited number of software packages for reliability evaluation are available from AT&T, Center for Software Reliability (City University of London) and Naval Surface Warfare Center (NSWC). However it was pointed out that in some cases, spreadsheets can be used.

Several attendees spoke of their frustration about not being able to obtain adequate data for their investigations. Availability of enough data is essential for validating reliability models and computational approaches. It is also needed for evaluating how different factors affect reliability and how they can be controlled. It was decided to initiate an effort to create a data base. It will include dynamic failure data as well as state metric data from several sources which will be made available to researchers without disclosing the source. Mojmir Mazur (Grumman EIC) has agreed to chair this committee.

A steering committee and several supporting committees have been formed. Frank Ackerman was elected the chair of the steering committee. The vice-chairs are Yashwant Malaiya (Colorado State University) and Mike Lyu. Anneliese von Mayrhauser (IIT, Chicago) has agreed to chair the next Symposium on Software Reliability Engineering in 1991. The site and the dates are yet to be decided.

For further information, contact Dr. Frank Ackerman, IZDSW, 85 Poplar Drive, Stirling NJ 07980, (201) 604-8701.

RELIABILITY CHAPTER
CENTRAL NEW ENGLAND COUNCIL
INSTITUTE OF ELECTRICAL AND
ELECTRONIC ENGINEERS

CALL FOR PAPERS

The Twenty–ninth Annual Spring Reliability Seminar is scheduled for April 25, 1991. The seminar will be hosted by the IEEE Boston Section Reliability Chapter. The theme of this year's seminar will be

"Staying Competitive in the 90's: Reliability, Maintainability & Quality for a Changing World"

A call for papers is issued in the following broad technology and management topic areas:

- **Reliability**
- **Maintainability/Supportability/Testability**
- **Availability**
- **System Safety**
- **Integrated Logistics Support**
- **Life Cycle Cost/Design–to–Cost**
- **Reliability Improvement Warranties**
- **Software Reliability/Quality Assurance**
- **Human Factors**
- **Reliability Growth**
- **CAD/CAE/CAL/CAM/CAT**
- **FMECA**

Interested authors should prepare and submit an abstract of 300 to 500 words, accompanied by a biographical sketch, by November 30, 1990. Selected authors will be notified by December 21, 1990. Completed papers, suitable for reproduction in the seminar proceedings, will be required by February 15, 1991.

Abstracts and biographical sketches should be sent to:

James Kalemba
GTE Government Systems
77 A Street
Needham Heights, MA 02194
M/S 5–37

Questions concerning the seminar may be directed to Anita Cederholm at (508) 870–7953 or Jim Kalemba (617)455–3394.

1991 ANNUAL RELIABILITY AND MAINTAINABILITY SYMPOSIUM

January 29, 30, 31

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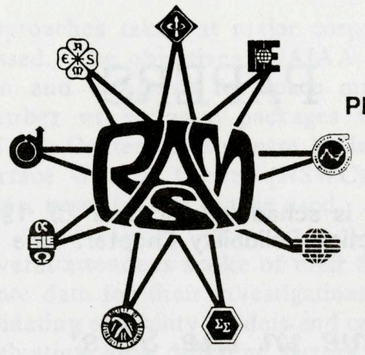

THEME

PRODUCT ASSURANCE-RETURN ON INVESTMENT

- Total Quality Management
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- Software R&M
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Suite 300W
Washington, DC 20024 USA
Phone: (202) 646-6327

WATCH THIS PUBLICATION FOR INFORMATION UPDATES

1991 Reliability Engineering Education Workshop

The second Reliability Engineering Education Workshop will be held preceding the 1991 RAMS in Orlando, Florida. The workshop is scheduled for Monday morning, January 28, 1991, and all participants are welcome.

The principal topic of discussion will be how to introduce R & M into the engineering curriculum. This must be done if we are to meet tomorrow's challenges for high quality, reliable products. But there are obstacles:

- Class time is limited and the engineering curriculum is already packed;
- Faculty must be trained in R&M techniques;
- Textbooks must be updated;
- Research projects must be initiated and supported.

Most importantly, faculty and students must be learn to view R&M as fundamental to a design -- on the same level with function, efficiency and cost -- not as an afterthought!

Solutions to these problems and ways for achieving the goal of giving more consideration to R&M in engineering education will be addressed at the workshop.

For more information on the 1991 RAMS Reliability Engineering Education Workshop contact:

John Bowles
Electrical and Computer Engineering
University of South Carolina
Columbia, S.C. 29208

phone: (803) 777-2689

A few copies of the proceedings from the 1990 RAMS Reliability Engineering Education Workshop are also available and can be obtained from the above contact.

1991 ANNUAL RELIABILITY AND MAINTAINABILITY SYMPOSIUM AND EXHIBITS PROGRAM

Theme: Product Assurance - Return on Investment

January 29-31 1991 — **Orlando Marriott**
Tutorials Start Jan 28 — **Orlando, Florida USA**

SPECIAL SPEAKERS

Keynote: John J. Hudiburg, Chairman Emeritus, Florida Power and Light
Banquet: Robert Galvin, Chairman of Executive Committee, Motorola Inc.

SPECIAL PANEL DISCUSSIONS

- Advisory Board: Communicating the Value of R&M to Senior Management
- "How Do We Do It Right?" with Major Quality Award Winners
- R&M During Tight Times
- The Impact of Product Reliability on Return on Investment

TUTORIAL SESSIONS

- •Basic Reliability
- •System Safety
- •Basic Fault Tree
- •Basic Logistics
- •Mechanical Systems Reliability
- •Life Cycle Costs/DTC
- •Environmental Stress Screening
- •Part Failure Mechanisms
- •Fault Tree Applications
- •Models & Methods in Reliability
- •Practical Reliability Engrg. & Mgmt.
- •Reliability of Repairable Systems

TECHNICAL PAPER SESSIONS

- •Supportability
- •Maintainability
- •Space Systems
- •Reliability Tools
- •Safety
- •Warranties
- •Logistics
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1991 INTERNATIONAL RELIABILITY PHYSICS SYMPOSIUM

April 8-11, 1991 ♦ Caesars Palace ♦ Las Vegas, Nevada

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The 1991 Symposium continues last year's focus for building reliability in to VLSI and hybrid components during their manufacture. All aspects of a product must be considered if we are to achieve the high reliability goals of the Nineties. This multi-disciplinary effort must include design for process tolerance, process stability, and manufacturability as well as the use of improved monitoring and testing methodologies. To meet this challenge, we encourage papers that address these specific areas and those that identify how interactions among manufacturing disciplines affect reliability. We also seek papers that enhance our understanding of how input parameters affect the failure mechanisms of concern and how their control leads to ever smaller manufacturing variability and ultimately even the elimination of failure mechanisms as reliability problems.

YOUR PAPERS ARE SOLICITED ON:

- BUILDING-IN RELIABILITY especially:
  - Process design methodologies (including circuit design)
  - CAR (Computer Aided Reliability) tools
  - Interaction of manufacturing disciplines
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  - In-line monitors and sensors
  - Input variables affecting reliability
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- TESTING METHODOLOGIES FOR RELIABILITY , including:
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  - Wafer level stressing
  - Reliability modeling
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- ANALYZING FOR RELIABILITY
  - **All** VLSI failure mechanisms and models including:
    - oxide integrity
    - stress voiding
    - corrosion
    - surface mount
    - electromigration
    - mechanical / thermal stressing
    - package integrity
    - ESD
  - Failure analysis techniques (new, advanced, simplified)
  - Analytical instruments & techniques

SUBMISSION DEADLINE: Postmarked no later than Oct. 1st, 1990

Please submit a one-page, 50-word abstract, and a two-page summary (which may include figures but no photographs or halftones) on 8-½ by 11-inch paper. Both must include the title of the paper, name and affiliation(s) of authors, complete return address, as well as telephone and telefax numbers. **Submissions should be by post / express mail** rather than by telefax, since the latter are not always of a legible quality. The summary must state clearly and concisely the specific results of your previously unpublished work, why the results are important, and how the results relate to prior work.

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PAPER SELECTION: The papers will be selected based on their technical merits and relevancy to the symposium's focus. This will be performed by a group of 25-30 people chosen from industry, government, and universities representing a broad spectrum of expertise in the field of reliability.

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PROCEEDINGS MANUSCRIPT: Final, camera-ready manuscripts must be received by February 9, 1991 so that the Proceedings can be available at the Symposium.

Authors of accepted papers are encouraged to submit their papers to the appropriate IEEE Transactions.

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Conference Calendar

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Oct. 9–10	Fourth Annual Leesburg Workshop on R&M CAE in Concurrent Engineering	Leesburg, VA	J. W. Thomas STEMCO 8730 Georgia Ave. Suite 600 Silver Spring, MD 20910 (301) 585-0421
Nov. 13–16	Reliability of Repairable System: Analysis and Applications	College Park, MD	Richard Jeffeson Valarie Smith (800) 888-8682 X7206
Nov. 26–29	The 8th International Conference of the Israel Society for Quality Assurance	Jerusalem, Israel	Marcel Friedman Chairman—Reliability Society Chairman IEEE Israel Section P.O. Box 413 Rishon Le Zion, Israel 70103
Dec. 3-6	National Conference on Quality and Reliability	Bombay, India	Prof. M. N. Gopalan Organizing Secretary: NCQR-90 Interdisciplinary Programme in Reliability Engineering I.I.T. Bombay 400076
1991			
Jan. 29–31	Annual Reliability and Maintainability Symposium	Orlando, FL	Program Chairman Dr. R. J. Lumas Lockheed Space Operations Operations MS LSO 291 1100 Lockheed Way Titusville, FL 32780 (407) 867-5921 Fax (407) 867-2131 Publicity L. M. Rabon, Jr. (703) 664-1003 (703) 664-2502
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Mar. 18–21	IEEE International Conference on Microelectronic Test Structures	Kyoto, Japan	Yukinori Kuroki Microelectronics Research Laboratories NEC Corporation 1120, Shimokuzawa, Sagamihara-Shi Kanagawa 229, Japan Tel: 81-427-71-0801 Fax: 81-427-71-0886
Apr. 8–11	1991 International Reliability Physics Symposium	Las Vegas, NV	General Information Patrick E. Kennedy General Chair, 1991 IRPS MSI (714) 970-6546
Apr. 18–20	11th Advances in Reliability Technology Symposium	Liverpool, England	Mrs. Ruth Cambell 11th Advances in Reliability Technology Symposium National Centre of Systems Reliability Ukaea, Wigshaw Lane Culteth, Warrington WA3 4NE UK Tel. (0925) 31 244 X4243 Fax (0925) 766 681

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Apr. 25	29th Annual Spring Reliability Seminar	Framingham, MA	Papers Sent To: James Kalemba GTE Government Systems 77 A Street Needham Heights, MA 02194 M/S 5-37 General Information: Anita Cederholm Data General 4400 Computer Dr. Westboro, MA 01581 M/S F017 (508) 366-8911 X3810 (508) 366-1272 (Fax)
Apr. 24–25	Tri-Service RAMCAD Group 6th Technical Interchange Meeting	Arlington, VA	Contact: 6th RAMCAD TIM Committee C/O Washington, DC Chapter of Sole P.O. Box 2645 Arlington, VA 22202 (703) 664-5771
Jun. 5–8	International Symposium on Reliability and Maintainability	Tokyo, Japan	ISR&M 1990 Tokyo Union of Japanese Scientists and Engineers 5-10-11 Sendagaya, Shibuya-Ku, Tokyo 151 Japan 03-352-2231 Fax 03-225-1813
Jun. 18–22	7th International Conference on Reliability and Maintainability	Brest, France	Secretariat for the 7th Conference CNET Division Lab/IFE BP 40 22301 Lannion Cedex France 96 052430 Fax 96 052372
Aug. 26-30	8th Reliability in Electronics Symposium (Relectronic '91)	Budapest, Hungary	Dr. Albert Balogh Scientific Society for Telecommunication H-1372 Budapest P.O. Box 451 Hungary
Sep. 24–26	1991 IEEE Autotestcon	Anaheim, CA	Robert C. Rassa Mantech Advance Systems International 150 S. Los Robles Ave. Suite 350 Pasadena, CA 91101
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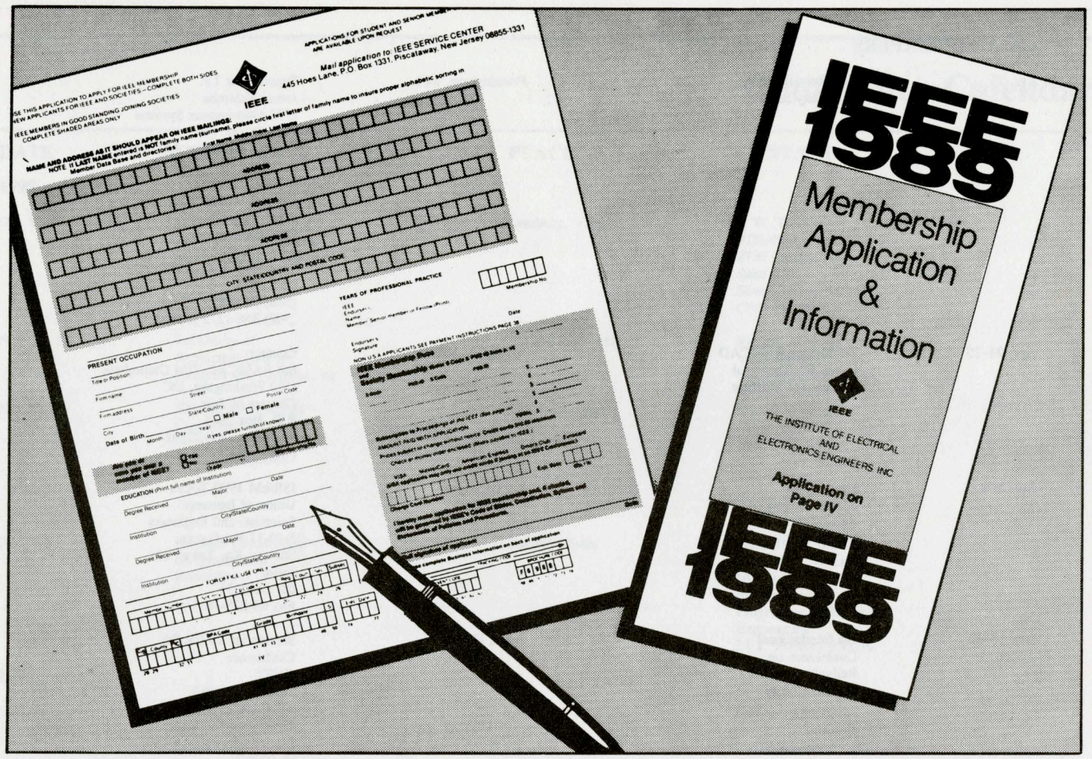

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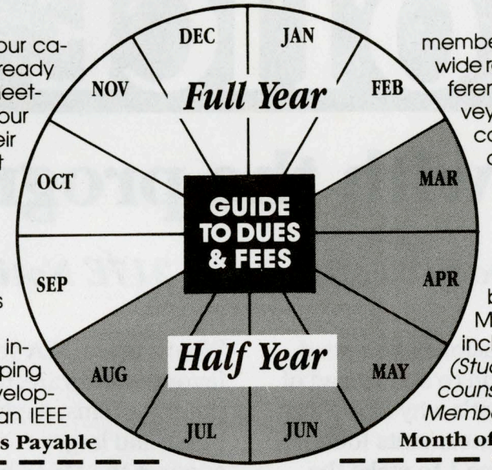

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