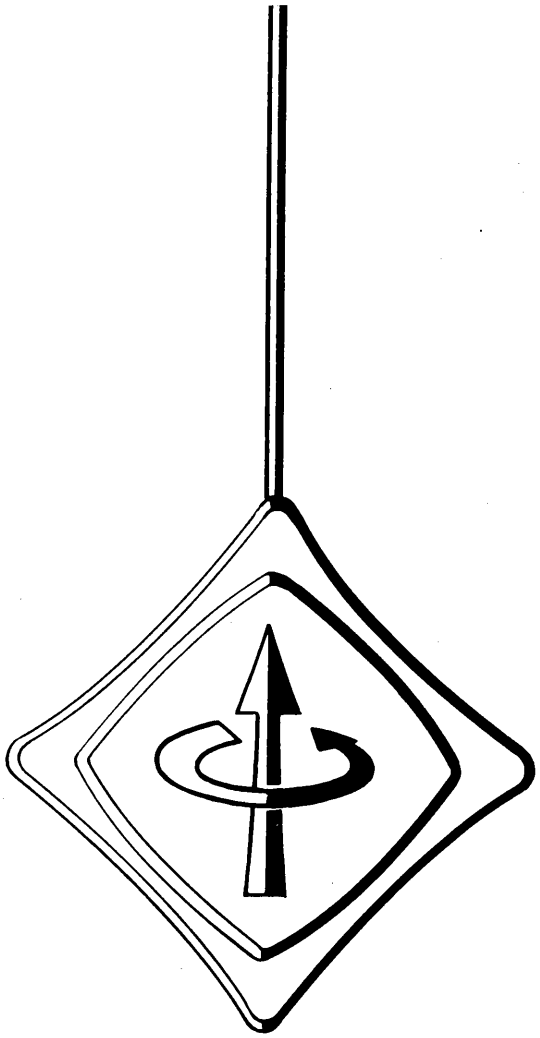


29th annual proceedings

reliability physics 1991

Las Vegas, Nevada • April 9, 10, 11, 1991

Sponsored by
the IEEE Electron Devices Society and
the IEEE Reliability Society

IEEE Catalog No. 91CH2974-4

1991 INTERNATIONAL RELIABILITY PHYSICS SYMPOSIUM

SYMPOSIUM OFFICERS

GENERAL CHAIR ..... P. E. Kennedy, *Management Sciences*
VICE GENERAL CHAIR ..... H. A. Schafft, *NIST*
SECRETARY ..... A. K. Goel, *Elite Microelectronics*
FINANCE ..... D. S. Gibson, *Harris*

SYMPOSIUM COMMITTEE CHAIRS

TECHNICAL PROGRAM ..... D. A. Baglee, *Intel*
PUBLICITY ..... R. C. Blish, II, *Intel*
REGISTRATION ..... D. J. LaCombe, *General Electric*
ARRANGEMENTS ..... J. W. McPherson, *Texas Instruments*
AUDIO-VISUAL ..... D. Feliciano-Welpe, *Oneida Research Services*
PUBLICATIONS ..... G. Riga, *Riga Analytical Lab*
EQUIPMENT DEMONSTRATIONS ..... P.J. Boudreaux, *DOD*
TUTORIAL ..... J. Klema, *Motorola*
WORKSHOPS ..... J. T. Yue, *AMD*
CONSULTANT ..... R. C. Walker, *SAR Associates*
CONSULTANT ..... D. F. Barber, *Scien-Tech Associates*

BOARD OF DIRECTORS

B. L. Euzent
Intel

H. A. Schafft
NIST

L. A. Kasprzak
IBM

W. H. Schroen
Texas Instruments

P. E. Kennedy
Management Sciences

R. W. Thomas
Rome Laboratory

N. McAfee
Westinghouse Electric Co.

M. H. Woods
Intel

Published by the

ELECTRON DEVICE SOCIETY AND RELIABILITY SOCIETY

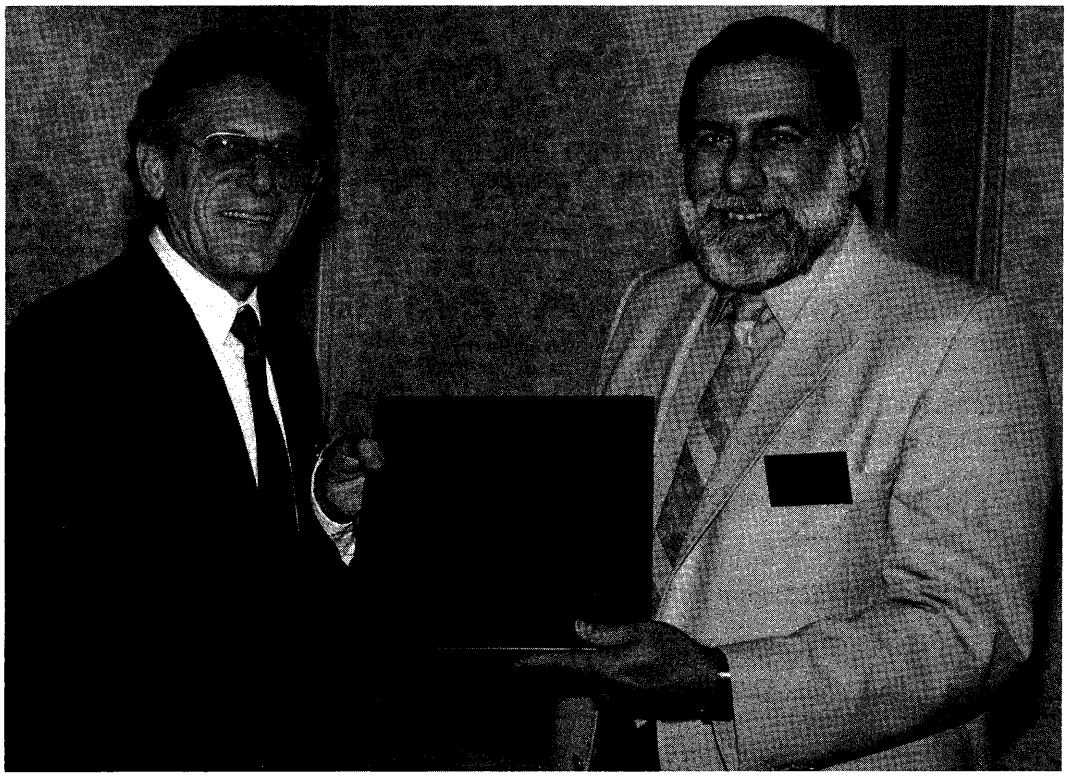
of the

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

IEEE Catalog No. 91CH2974-4
Library of Congress Catalog No. 82-640313
ISBN: 0-87942-680-2 Soft Cover
ISBN: 0-87942-681-0 Hard Cover
ISBN: 0-87942-682-9 Microfiche

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

28 March, 1990, New Orleans, Louisiana



Walter Schroen *(left)* presented the award to Al Tamburrino *(right)*

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, several 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 Chair, General Chair (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.

TABLE OF CONTENTS

KEYNOTE

PACKAGING

Session Co-Chairs: Jack McCullen and Ricardo Perez

METALLIZATION I

Session Co-chairs: James Cottle and Frederick G. Yost

METALLIZATION II

Session Co-chairs: Birendra N. Agarwala and James Cottle

DIELECTRICS/HOT CARRIERS I

Session Co-chairs: Bob Yun and Eiji Takeda

FAILURE ANALYSIS I

Session Co-chairs: Art Rawers and Jay S. Dickinson

MEMORY/BIPOLAR

Session Co-chairs: Walter Slusark, Tim E. Turner, and Charvaka Duvvury

COMPOUND SEMICONDUCTORS

Session Co-chairs: Douglas H. Loescher and Wallace Anderson

FAILURE ANALYSIS II

Session Co-chairs: Donald Staab and Michael P. Strizich

PROCESS

Session Chair: Dave Willmott

POSTER SESSIONS

Session Co-chairs: Dave Willmott, Ajit Goel, and Jamal Deen

DIELECTRICS/HOT CARRIERS II

Session Co-chairs: William R. Hunter and Paul Marcous