

# The 1985 MTT-S International Microwave Symposium

FRED J. ROSENBAUM, FELLOW, IEEE

**S**T. LOUIS WAS THE venue of the 1985 IEEE-MTT-S Microwave Symposium and Workshops. This was the first time that the Symposium was hosted in St. Louis and the first Midwestern meeting since the 1971 gathering in Arlington Heights, IL. The conference and associated events were held in the Cervantes Convention Center, a spacious downtown facility that comfortably accommodated both the technical meetings and the Exhibition. The Sheraton St. Louis Hotel served as the headquarters hotel. Five other major hotels were also occupied by conference participants. As our meeting has grown, it has become difficult to find a single facility that can provide suitable meeting and exhibition space and adequate hotel space as well. For that reason, we chose to locate at the Convention Center and use off-site hotels. Nearly continuous shuttle bus service was provided between the Center and the conference hotels. This was particularly helpful to many of the participants as St. Louis experienced a period of rainy weather during the meeting.

Microwave Week began on June 3 with the 1985 IEEE Microwave and Millimeter-Wave Monolithic Circuits Symposium. The MTT-S Symposium met from June 4 to June 6, and the 25th ARFTG Conference was held on June 6 and 7. During the week, there were numerous other technical activities including three workshops and four panel sessions. A joint session between the Monolithic Symposium and MTT-S was held on Tuesday, June 4. The Microwave Exhibition and the MTT-S Historical Exhibition were located in the Cervantes Center. Numerous social events were enjoyed throughout the week, highlighted by the annual Awards Banquet, held on Wednesday evening, June 5, 1985.

The Symposium was officially opened by Steering Committee Chairman Fred J. Rosenbaum at a well-attended plenary session. Harlan Howe, Jr., MTT-S President, welcomed the participants. Technical Program Committee Co-Chairman William Hord outlined the Technical Program and IEEE President-Elect Bruno Weinschel made some remarks on increasing productivity in our industry. The plenary session was chaired by Robert Moore, MTT-S PACE Coordinator. In keeping with the theme of the Symposium, *Microwaves: Gateway to the Future*, the plenary session sought to address the future of microwave engineers. Merrill Skolnik spoke on the technical future of the field, David Leeson considered success in the professional and industrial sector, and Stephen Honickman spoke to the economic future for engineers in the field. This well-presented and well-attended session held everyone's



Nathan Marcuvitz receiving the 1985 Microwave Career Award from Harlan Howe.

interest, as evidenced by the fact that 250 people met, over lunch, with the speakers, joined by Leo Young, George Gamota, and Harvey Nathanson to continue the discussion.

Also at the lunch hour on Tuesday, a new endeavor for the Symposium was launched. Chaired by Frank Walker, a *Working Group on Microwave Procurement* was formed. This group is intended to provide a forum for business people, marketing managers, engineers, and procurement people to discuss business aspects of the microwave industry.

A number of other innovations were offered the Symposium-goer this year. VISA and MASTERCARD were accepted at registration for the first time as a convenience to participants. Shipping service was provided so that extra digests and materials from the Exhibition could be shipped home conveniently. Travel expenses for students presenting technical papers were provided for this year. Tickets were obtained free of charge by the Steering Committee from the Symposium airline, TWA. Five students attended the Symposium with this assistance. And to remind MTT-S members of the important dates of the microwave year, an MTT-S calendar was sent to each. These have proved to be very popular and are much in evidence around the industry. Perhaps this will become an annual item.

In addition to the Exhibition and the Technical Program, and excellent guests' program was planned to acquaint the visitor with some of the scenic, cultural, and historical aspects of St. Louis.

The annual Awards Banquet was the high point of the



Harlan Howe congratulating Karl Niclas and Brett Tucker on their award of the 1985 Microwave Prize for their work on noise in distributed amplifiers.

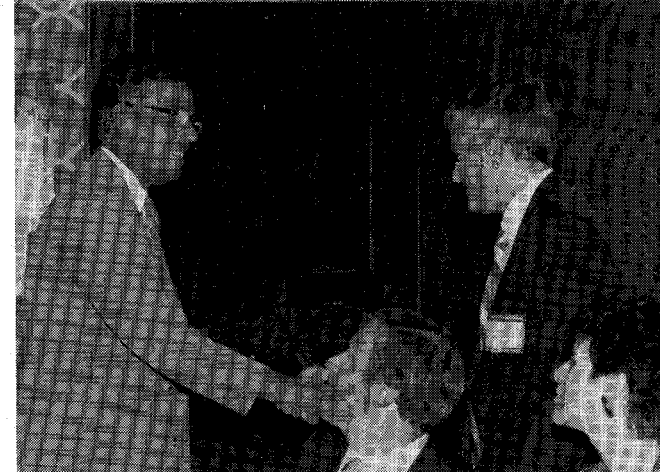


Pete Rodrigue expressing his thoughts after receiving the Distinguished Service Award. This is only the third time the award has been granted by the IEEE-MTT Society. AdCom President Harlan Howe is in the back-ground.



James Cheal accepts the 1985 Microwave Applications Award for his contributions to the design and development of the OSM connector from Harlan H. Howe.

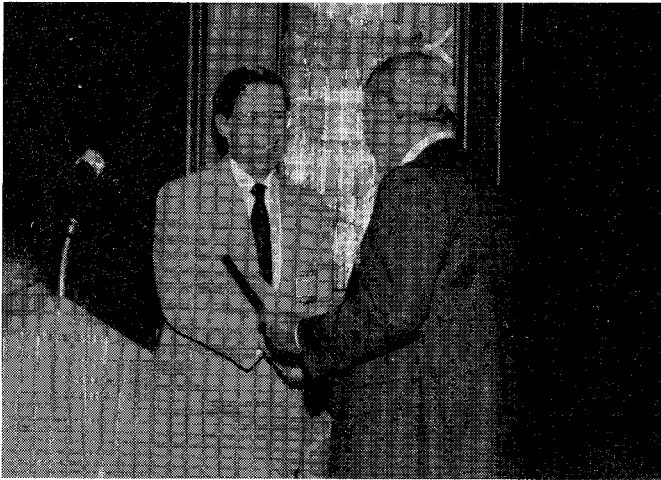
social events during the Symposium. It was held in the Main Ballroom of the Marriott Hotel, preceded, as usual, by the Industry-Sponsored Cocktail Party. Four hundred and forty-three guests dined well, received favors, and enjoyed string quartet music. Harlan Howe, Jr. presented the awards, after himself being awarded a giant gavel from the City of St. Louis. Nathan Marcuvitz received this year's Microwave Career Award. Harold M. Barlow was also named recipient of this award. The 1984 Microwave Prize was shared by Karl B. Niclas and Brett A. Tucker. The Microwave Applications Award went to James Cheal. The third Distinguished Service Award granted by the MTT Society was presented to George P. "Pete" Rodrigue. Distinguished Microwave Lecturer certificates and plaques were presented to Paul Greiling and Sander Weinreb. Fred Rosenbaum and Stephen Adam received Certificates of Meritorious Service, and H. George Oltman, Jr. was presented with the Past President's Pin. Finally, Bruno O. Weinschel, 1985 IEEE President-Elect, made the presenta-



Paul T. Greiling and Sander Weinreb accepting plaques from Harlan Howe to mark their service as MTT-S 1985 Distinguished Microwave Lecturers. Greiling also received the IEEE Fellow Certificate at the symposium.

tion of IEEE Fellow Awards to those who chose to receive them at the Symposium, Edgar Denlinger and Paul Greiling.

Following the award presentations, an energetic and



Bruno O. Weinschel presents the IEEE Fellow Certificate to Edgar Denlinger.



Harlan Howe receiving an official City of St. Louis gavel at the Awards Banquet.

delightful musical "Riverboat Review" was presented by Young America. The evening closed with dancing to the big band sound.

### HISTORICAL EXHIBITS AND MICROWAVE EXHIBITION

The Historical Exhibit has proved to be a durable and popular part of the Symposium. It comprises a permanent collection of artifacts assembled by Chief Curator Ted Saad, and materials contributed by each Steering Committee. This year, Harold Shipton was responsible for obtaining interesting items pertaining to the early years of radar.

This year's Microwave Exhibition presented a strong showing of industry product and practice. Some two hundred and eight companies employed 321 booths in the Cervantes Convention Center. The exhibitors are to be admired for the high quality of their displays. Howard Ellowitz of Horizon House once again demonstrated outstanding leadership in organizing the highly professional Microwave Exhibition.

### SYMPOSIUM ATTENDANCE

The grand total of Symposium attendance was 4190. Total MTT-S Technical Program registration was 1466, down 6 percent from San Francisco in 1984. An all-time high of 697 attended the Microwave Millimeter-Wave Monolithic Circuits Symposium. The workshops were also well attended by some 326 participants in all. Some 232 attended the Modern Microwave Oscillator Design Techniques Workshop on Friday, June 7, the last day of Microwave Week. The Phased Arrays for Hyperthermia Treatment of Cancer Workshop drew 37, while 57 came to the Procurement Strategies Working Group Meeting. Also on Friday, ARFTG attendance numbered 143.

### TECHNICAL PROGRAM

The Technical Program was again limited to three parallel sessions. Two Open Forums were presented, as well as 29 one-and-one-half hour sessions. The Technical Program Sessions and their Chairmen are listed below.

- Session A:* Plenary Session  
R. Moore, Westinghouse Electric Corp., Baltimore, MD
- Session B:* Monolithic Receiver Circuits  
C. Huang, Anadigics, Morristown, NJ  
R. Kagiwada, TRW, Redondo Beach, CA
- Session C:* Biomedical Aspects of Microwaves  
J. C. Lin, University of Illinois, Chicago, IL
- Session D:* Communication Systems  
G. L. Heiter, AT&T-Bell Laboratories, North Andover, MA
- Session E:* Monolithic Millimeter-Wave Circuits  
H. J. Kuno, Hughes Aircraft Co., Torrance, CA  
A. Chu, M/A-COM, Burlington, MA
- Session F:* Guided Waves  
C. M. Krowne, NRL, Washington, DC
- Session G:* Integrated Microwave Systems  
K. K. Agarwal, Rockwell International, Dallas, TX

- Session H:* Open Forum  
*Session I:* Acoustics and Ferrites  
 J. M. Owens, University of Texas, Arlington, TX  
*Session J:* FET Oscillators  
 E. C. Niehenke, Westinghouse Electric Corp., Baltimore, MD  
*Session K:* Microwave Filter Networks  
 A. E. Williams, COMSAT Laboratories, Clarksburg, MD  
*Session L:* Optical and Submillimeter Wavelength Technology  
 K. J. Button, MIT, Cambridge, MA  
*Session M:* FET Amplifiers  
 S. J. Temple, Raytheon Co., Bedford, MA  
*Session N:* Filters and Multiplexers  
 A. E. Atia, COMSAT, Washington, DC  
*Session O:* Millimeter-Wave Component Technology I  
 A. G. Cardiasmenos, Raytheon Co., Bedford, MA  
*Session P:* Solid State Sources and Amplifiers  
 P. W. Staecker, MIT Lincoln Laboratory, Lexington, MA  
*Session Q:* Computer Modeling and Design of Nonlinear Networks  
 B. S. Perlman, RCA Laboratories, Princeton, NJ  
*Session R:* Millimeter-Wave Component Technology II  
 G. R. Thoren, Raytheon Co., Bedford, MA  
*Session S:* Open Forum II  
*Session T:* Solid State Device Topics  
 J. F. White, M/A-COM, Burlington, MA  
*Session U:* Low Noise HEMT Amplifiers  
 R. L. Camisa, RCA Laboratories, Princeton, NJ  
*Session V:* Continuous and Discontinuous Microstrip Structures  
 J. W. Mink, US Army Research Office, Research Triangle Park, NC  
*Session W:* Network Analyzer Techniques  
 H. G. Oltman, Jr., Hughes Aircraft Co., Canoga Park, CA  
*Session X:* FET Applications  
 F. N. Sechi, RCA Laboratories, Princeton, NJ  
*Session Y:* Waveguiding Structures  
 N. G. Alexopoulos, University of California, Los Angeles, CA  
*Session Z:* Microwave Measurements  
 S. F. Adam, Adam Microwave Consulting, Los Altos, CA  
*Session AA:* Solid State Device Applications-Non FET  
 C. Buntschuh, Narda Microwave Corp., Hauppauge, NY  
*Session BB:* Microwave Integrated Circuit Techniques  
 E. F. Belohoubek, RCA Laboratories, Princeton, NJ

- Session CC:* Computer-Aided Design Techniques for Linear Circuits  
 S. L. March, Compact Software, Round Rock, TX

#### PANEL SESSIONS AND WORKSHOPS

- I. Future of Microwave Engineers: Impact of DOD Funding of R&D on Small and Large Companies and Academic Institutions  
 Robert A. Moore, Westinghouse Electric Corp., Baltimore, MD
- II. Advances in Millimeter Wave Subsystems  
 T. H. Oxley, Marconi Electronic Devices, Ltd., UK  
 J. B. Horton, TRW, Redondo Beach, CA
- III. Historical Perspective of Microwaves  
 Harold Shipton, Washington University, St. Louis, MO
- IV. Millimeter Wave Integrated Circuits  
 James C. Wiltse, Georgia Tech Research Institute, Atlanta, GA
  - \* Phased Arrays for Hyperthermia Treatment of Cancer  
 James C. Lin, University of Illinois, Chicago, IL
  - \* Modern Microwave Oscillator Design Techniques  
 Edward C. Niehenke, Westinghouse Electric Corp., Baltimore, MD
  - \* Working Group—Microwave Procurement: Strategies for the Late 80's and 90's  
 Frank Walker, Sanders Associates, Nashua, NH

#### 1985 SYMPOSIUM STEERING COMMITTEE

The St. Louis Symposium Steering Committee did an outstanding job. I was impressed with their dedication, professionalism, and the hard work that they devoted to making the Symposium the memorable event that it was. One of the most satisfying rewards of professional society membership is association with people such as these. A list of the Steering Committee members and their employers follows.

- |                          |   |
|--------------------------|---|
| <i>Chairman:</i>         | Fred Rosenbaum, Washington University                             |
| <i>Vice-Chairman:</i>    | James Roe, Peterson-Roe Corporation                               |
| <i>Secretary:</i>        | William Ruff, Central Microwave Co.                               |
| <i>Technical Program</i> |   |
| Co-Chairman:             | William Hord, Microwave Applications Group                        |
| Co-Chairman:             | Stephen Honickman, STG Electrosystems                             |
| Special Sessions:        | Geoffrey Lampel, Central Microwave Co.                            |
| <i>Finance:</i>          | Gustave Lindauer, Emerson Electric                                |
| <i>Publications:</i>     | Louis Medgyesi-Mitschang, McDonnell Douglas Research Laboratories |
|                          | James Madson, McDonnell Douglas Research Laboratories             |



1985 Symposium Program Committee  
*Standing (l-r):* F. Ivanek, S. N. Honickman  
*Seated (l-r):* M. Cohn, L. R. Whicker, W. Hord, F. J. Rosenbaum



1985 Technical Program Committee  
*(l-r):* C. R. Boyd, T. J. Lukaszek, J. C. Lin, A. Rosen



1985 Symposium Steering Committee  
*Standing (l-r):* M. R. Rosen, R. J. Gilmore, G. A. Lindauer,  
 J. K. Hoyt, J. L. Bogdanor, H. W. Shipton, S. N. Honickman,  
 M. W. Muller, J. M. Madson, F. J. Rosenbaum  
*Seated (l-r):* C. E. Larson, L. N. Medgyesi-Mitschang, J. M. Roe,  
 W. Hord, W. A. Ruff, W. P. Connors

*Arrangements:* William Connors, McDonnell Douglas Microelectronics Co.  
 Mimi Rosen, St. Louis Scene, Inc.  
*Publicity:* Curtis Larson, McDonnell Douglas Astronautics Co.  
 Jeffrey Hoyt, McDonnell Douglas Astronautics Co.  
*Registration:* John Bogdanor, McDonnell Aircraft Co.  
*Transactions*  
*Special Editor:* Marcel Muller, Washington University  
*Historical Exhibit:* Harold Shipton, Washington University  
*Microwave Exhibition:* Howard Ellowitz, Horizon House  
*Member-at-large:* Rowan Gilmore, Central Microwave Co.

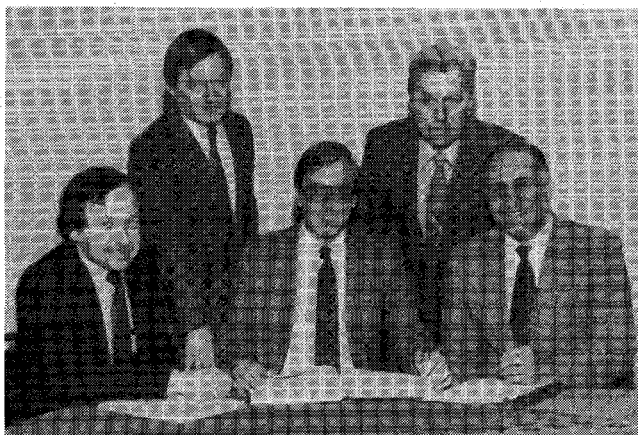
#### 1985 TECHNICAL PROGRAM COMMITTEE

The technical sessions are the core of the symposium. Each year, the Technical Program Committee solicits and selects papers which describe important advances in the

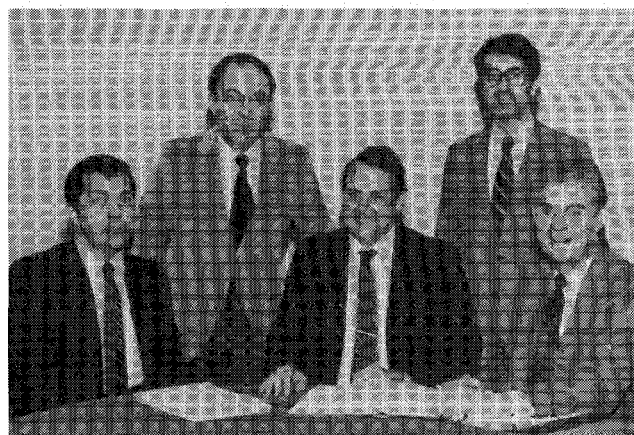
field. The quality of the Symposium is measured by the quality of the Technical Program. Each year's committee strives to present the best possible program in the most effective format. The people who contributed their expertise, time, and effort for the 1985 symposium are listed below.

S. Adam	P. T. Greiling	A. A. Oliner
K. K. Agarwal	B. R. Hallford	H. G. Oltman, Jr
N. G. Alexopoulos	D. Hanson	J. M. Osephchuk
A. E. Atia	G. R. Harrison	J. M. Owens
Y. Ayasli	G. L. Heiter	D. Parker
J. Barrera	R. B. Hicks	S. T. Peng
H. C. Bell	S. Honickman	B. S. Perlman
E. F. Belohoubek	W. E. Hord	A. Podell
B. Berson	D. Hornbuckle	R. A. Pucel
L. Besser	J. B. Horton	J. Raue
D. M. Bolle	H. Howe	G. P. Rodrigue
C. R. Boyd, Jr.	T. Itoh	A. Rosen
L. Q. Bui	F. Ivanek	F. J. Rosenbaum
C. Buntschuh	G. Jerinic	C. T. Rucker
K. J. Button	R. Kagiwada	T. S. Saad
R. Camisa	D. Kajfez	F. N. Sechi
A. G. Cardiasmenos	R. H. Knerr	A. K. Sharma
P. H. Carr	J. B. Knorr	R. Snyder
M. Caulton	C. M. Krowne	H. Sobol
A. Clavin	C. M. Kudsia	R. Sparks
E. Cohen	M. Kumar	B. E. Spielman
M. Cohn	H. J. Kuno	P. Staecker
N. W. Cox	R. W. Laton	D. Steinbrecher
J. Crescenzi	R. LaTourrette	R. Swartley
H. M. Cronson	R. Levy	J. J. Taub
J. E. Degenford	J. C. Lin	S. J. Temple
E. J. Denlinger	T. Lukaszek	G. Thoren
N. R. Dietrich	D. W. Maki	K. Tomiyasu
S. Dixon, Jr.	S. L. March	R. J. Wenzel
M. Dydyk	G. Matthaei	J. J. Whehler, Jr
L. Eastman	M. A. Maury, Jr.	L. R. Whicker
G. F. Engen	D. N. McQuiddy, Jr.	J. White
O. P. Gandhi	J. Mink	A. E. Williams
B. D. Geller	K. B. Niclas	J. C. Wiltse
V. G. Gelnovatch	E. C. Niehenke	W. R. Wisseman
R. Gilmore	S. Okwit	M. Yoder





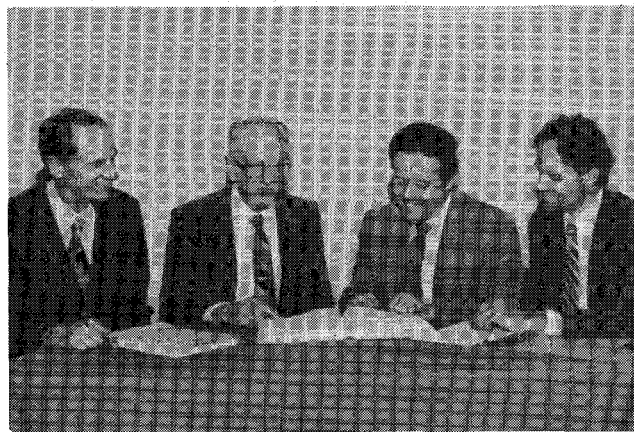
1985 Technical Program Committee  
*Standing (l-r):* J. E. Degenford, K. B. Niclas  
*Seated (l-r):* B. D. Geller, S. J. Temple, R. L. Camisa



1985 Technical Program Committee  
*Standing (l-r):* E. J. Crescenzi, Jr., F. N. Sechi  
*Seated (l-r):* J. S. Barrera, E. C. Nichenke, B. L. Berson



1985 Technical Program Committee  
*Seated (l-r):* N. G. Alexopoulos, J. W. Mink, D. M. Bolle



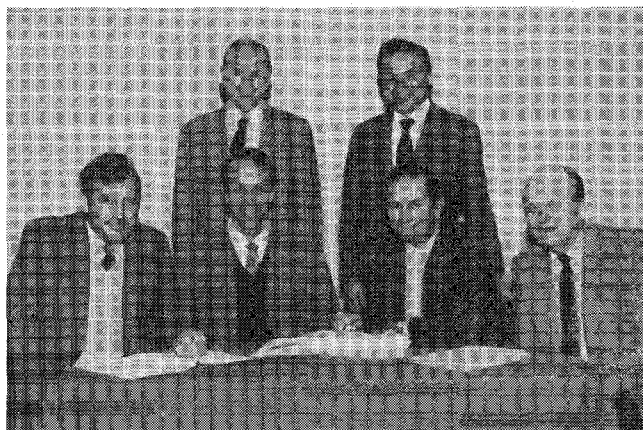
1985 Technical Program Committee  
*(l-r):* P. M. LaTourrette, G. L. Matthaei, R. V. Snyder,  
 A. E. Williams



1985 Technical Program Committee  
*Standing (l-r):* S. L. March, S. T. Peng  
*Seated (l-r):* D. Kajfez, B. S. Perlman, E. J. Denlinger



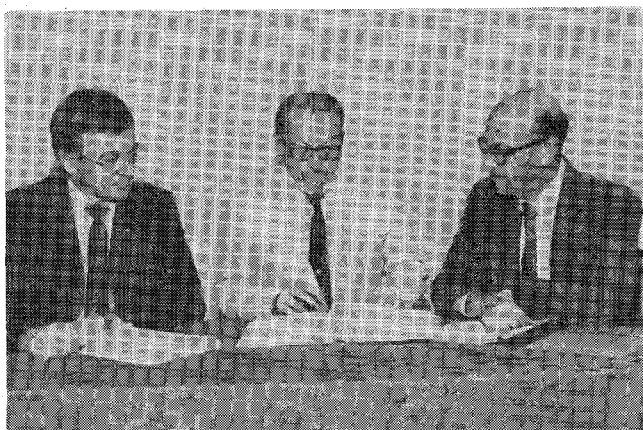
1985 Technical Program Committee  
*(l-r):* L. Bui, C. M. Krowne, A. K. Sharma, T. Itoh



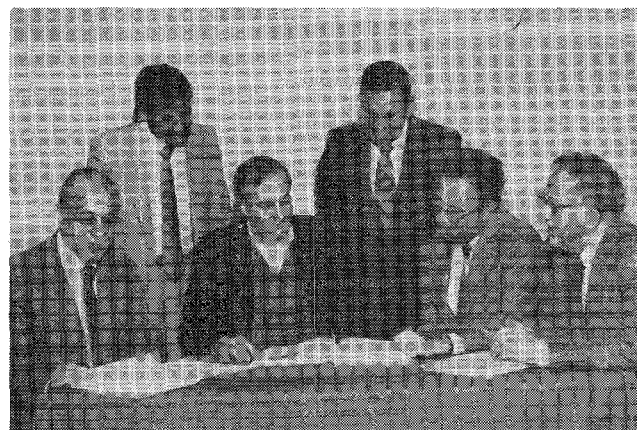
1985 Technical Program Committee  
*Standing (l-r):* J. J. Whelehan, R. A. Pucel  
*Seated (l-r):* R. E. Ham, J. M. Owens, E. F. Belohoubek,  
 N. R. Dietrich



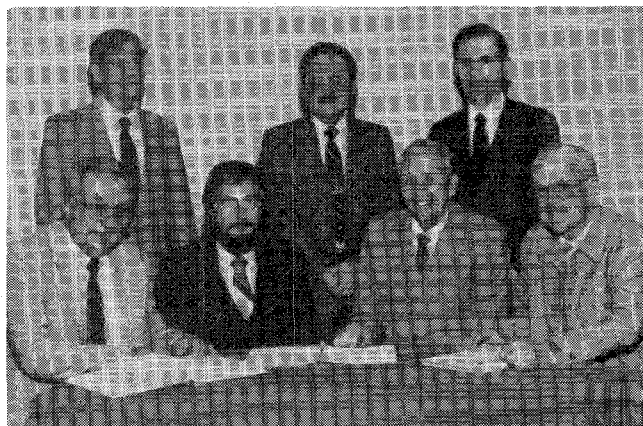
1985 Technical Program Committee  
*Standing (l-r):* J. E. Raue, S. Dixon  
*Seated (l-r):* G. R. Harrison, G. R. Thoren, A. G. Cardiasmenos,  
 M. Dydyk



1985 Technical Program Committee  
*(l-r):* R. H. Knerr, K. J. Button, H. Sobol



1985 Technical Program Committee  
*Standing (l-r):* C. M. Kudsia, A. E. Atia  
*Seated (l-r):* J. J. Taub, H. C. Bell, H. Howe, Jr., T. S. Saad

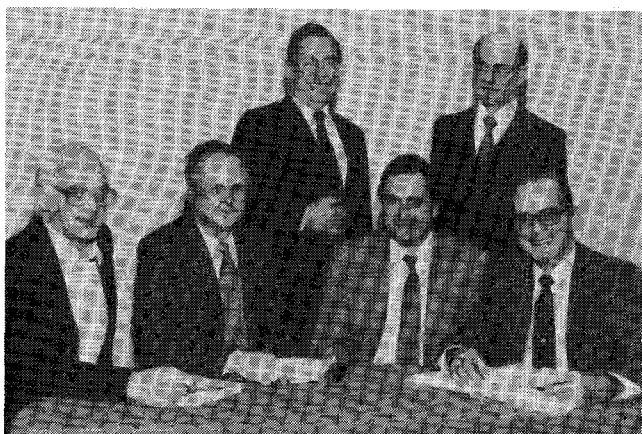


1985 Technical Program Committee  
*Standing (l-r):* H. M. Cronson, M. A. Maury, Jr., R. H. Swartley  
*Seated (l-r):* S. F. Adam, R. W. Laton, H. G. Oltman, Jr.,  
 G. F. Engen



1985 Technical Program Committee  
*(l-r):* P. W. Staecker, G. Jerinic, N. W. Cox





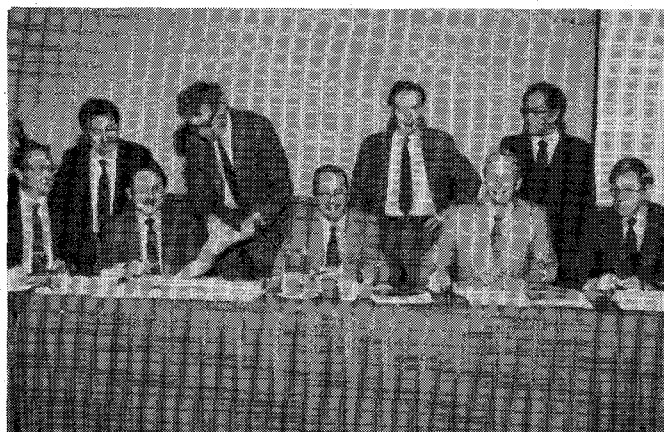
1985 Technical Program Committee  
*Standing (l-r):* D. H. Steinbrecher, B. R. Hallford  
*Seated (l-r):* C. D. Buntschuh, J. F. White, E. D. Cohen,  
 C. T. Rucker



1985 Administrative Committee  
*Standing (l-r):* V. G. Gelnovatch, T. S. Saad, H. Sobol  
*Seated (l-r):* R. A. Sparks, G. Jerenic, R. H. Knerr,  
 B. E. Spielman



1985 Technical Program Committee  
*Standing (l-r):* G. L. Heiter, K. K. Agarwal  
*Seated (l-r):* J. B. Horton, S. Okwit, R. A. Sparks,  
 D. N. McQuiddy



1985 Administrative Committee  
*Standing (l-r):* T. Itoh, M. V. Schneider, F. Ivanek, R. Kagiwada  
*Seated (l-r):* E. C. Niehenke, M. A. Maury, Jr., C. T. Rucker,  
 H. G. Oltman, Jr., P. W. Staecker

#### 1985 MTT-S ADMINISTRATIVE COMMITTEE

The MTT Society is governed by the Administrative Committee, whose 18 elected members commit their efforts on behalf of the society. The 1985 AdCom is listed here.

##### Society Officers

*President:* H. Howe, Jr.  
*Vice-President:* R. H. Knerr  
*Secretary/Treasurer:* P. W. Staecker

##### Administrative Committee Membership

N. W. Cox	G. Jerinic	D. N. McQuiddy, Jr.
V. G. Gelnovatch	R. Kagiwada	E. C. Niehenke
P. T. Greiling	R. H. Knerr	J. E. Raue
H. Howe, Jr.	H. J. Kuno	M. V. Schneider
F. Ivanek	R. Levy	B. E. Spielman
T. Itoh	S. L. March	S. J. Temple

##### Ex-Officio (Past Presidents)

R. A. Sparks      C. T. Rucker      H. G. Oltman, Jr.

##### Honorary Life Members

A. C. Beck	A. A. Oliner	K. Tomiyasu
S. B. Cohn	T. S. Saad	L. Young



1985 Administrative Committee  
*Standing (l-r):* D. N. McQuiddy, Jr., N. W. Cox, H. J. Kuno  
*Seated (l-r):* H. Howe, Jr., S. L. March, G. Thoren, S. J. Temple,  
 P. T. Greiling, J. E. Raue