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Reflections on the 1982 IEEE MTT-S International Microwave Symposium

by *David N. McQuiddy, Jr.*

The 1982 IEEE MTT-S International Microwave Symposium, associated workshops, and exhibition were held at the Hyatt Regency Hotel, Dallas, Texas, during the week of June 13 through June 19, 1982. As has been the case during the past few years, the Symposium and related events were well attended. Officially, 1267 people registered for the Symposium with an additional 51 people registering for the workshops only. The one day Symposium on Microwave and Millimeter-Wave Monolithic Circuits drew 447 registrants, all but 30 of whom also registered for the International Microwave Symposium. Workshops registration was 257. Exhibitors and exhibits only registration totaled 2105. Including exhibitors, it is estimated that approximately 3300 microwave people were at the Hyatt Regency during the week.

The Symposium activities began on Sunday afternoon, June 13, with the opening of the registration booths and concluded on Saturday afternoon with the completion of the workshop on Automatic RF Techniques. The regular contributed papers were presented in four parallel sessions conducted from Tuesday through Thursday afternoon. There were two panel sessions on both Tuesday and Thursday evenings. One workshop was held on Monday, prior to the official Symposium opening, and two were held on Friday. The main Symposium sessions and panels were scheduled to provide continuity with the Microwave and Millimeter-Wave Monolithic Circuits Symposium that was held on Friday.

The Symposium officially opened with a welcome by MTT-S AdCom President, Richard Sparks, and the Steering Committee Chairman, Dave McQuiddy. The Keynote Session followed with three presentations that supported the Symposium theme, "Thirty Years of Microwaves." Mr. Theodore S. Saad, President of Sage Labora-



tories, reviewed microwave technology advancements during the past thirty years. In a companion paper, Dr. Huang Hung-Chia, Vice President of the Shanghai Institute of Science and Technology and Chairman of the Society of Microwaves, Chinese Institute of Electronics, People's Republic of China, reported on "Thirty Years of Microwaves in China." The third presentation was prepared by Dr. Leo Young, Director of Research and Technical Information, Office of the Undersecretary of Defense for Research and Engineering, and addressed the future of microwaves. Dr. Young was unable to attend and his paper was presented by Dr. Lawrence R. Whicker of the Naval Research Laboratory. This opening session was followed by well attended technical sessions. Substantial audiences were noted at the opening session, the GaAs FET Amplifier session, the High Power Techniques session, the Nonlinear Applications of GaAs FETs session, and the Microwave Measurements session.

The Wednesday evening Awards Banquet provided an opportunity to relax, enjoy a marvelous dinner of beef Wellington, and honor those of our profession selected for recognition. Additionally, the contributions of the MTT-S AdCom past Presidents were recognized by reading their names in the order of their service. Of the 29 past Presidents, 15 were present at the banquet. The evening was concluded with entertainment provided by the talented group *Riders In The Sky*, who combined the beautiful harmony of Western swing

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SYMPOSIUM REFLECTIONS (from page 1)

with old cowboy ballads and innovative comedy sketches.

The banquet attendees (approximately 525) listened attentively as Dr. Arthur Oliner's and Dr. Akio Matsumoto's career accomplishments were described by Richard Sparks. They were both recipients of the Microwave Career Award. Dr. Matsumoto was unable to attend the banquet due to an illness in the family and Dr. Risaburo Sato accepted the Award on his behalf. The Microwave Applications Award was presented to Dr. Charles R. Boyd, Jr. for "advancing the state-of-the-art of microwave ferrite devices and the application of these devices to ferrite control elements." The Microwave Prize was presented to Kumikatsu Kobayashi, Dr. Yashiaki Nemoto, and Dr. Risaburo Sato for their paper, "Kuroda's Identity for Mixed Lumped and Distributed Circuits and Their Application to Nonuniform Transmission Lines," (vol. MTT-29, no. 2). Dr. Fred Rosenbaum was awarded the Past President's pin and Dr. Ferdo Ivanek received a plaque in recognition of his service as MTT-S National Lecturer. Al Clavin was presented a Certificate of Recognition for his outstanding performance as General Chairman for the 1981 MTT-S Symposium. Dr. Don Parker received a Certificate of Recognition for his work as Technical Program Chairman for the 1981 Microwave Symposium. Robert Puttre was recognized for originating the MTT-S logo with a Certificate of Recognition. The Central Illinois Chapter and the India Chapter received Special Membership Recognition for membership growth. Dr. Kiyo Tomiyasu, Chairman of IEEE Technical Activities Board Award and Recognition Committee, presented Fellow Certificates to seven MTT-S members in attendance that have been elevated to the grade of Fellow of the IEEE. They were Ken Button, Charles Rucker, Dr. Don Parker, Dr. Tatsuo Itoh, Dr. James Gewartowski, Vladimir G. (Walt) Gelnovatch, and Samuel Hopfer.

The Historical Exhibit was prominently featured in keeping with the Symposium theme. The focal point of the exhibit was an engineer's desk furnished with calculating aids, reference books, and older test equipment which served to emphasize the impressive advances which the microwave profession has attained over the last thirty years.

This year's Symposium exhibition was the largest MTT-S has had with 198 booths occupied by 172 exhibitors. This represents greater than 25 percent increase from the previous year. With this large exhibition and the exhibits only registration of over 2100 people, our large hotel was stressed to capacity. The 30,000 square feet of meeting rooms and 35,000 square feet of exhibit space were fully occupied.

Thanks to the diligent efforts of the eighty-six participating members of the Technical Program Committee under the leadership of Steven March and Dr. Jerome Butler, 170 contributed and invited papers were selected for presentation at the Symposium. Those papers were presented in eighteen

"full-length" sessions and seven shorter "half-length" sessions. The papers came from seventeen countries, acknowledging the international flavor of the Symposium.

The 1982 IEEE MTT-S International Microwave Symposium was in the planning stages for more than four years. During that time, many volunteer workers contributed untold hours to complete the tasks that accompany a symposium of this magnitude. Their enthusiasm and devotion is reflected in the final results. A number of local companies supported the efforts required without waiver, and this is greatly appreciated. The convention staff of the Hyatt Regency responded to every need in a timely and courteous manner. Ted Saad was a big help with the Historical Exhibit, an area that received special emphasis due to the historical theme of the Symposium. Horizon House and Howard Ellowitz organized and managed the exhibition in a very professional manner.

Thanks to the diligent efforts of a vast number of extremely professional individuals, the 1982 IEEE MTT-S International Microwave Symposium was a very rewarding and successful event.

D. N. McQuiddy, Jr.
Chairman, Steering Committee



IEEE INCREASES DUES

Following its annual review of the state of the IEEE's finances, the IEEE's Board of Directors voted 20 to 0 with one abstention to raise the basic member dues from \$45 to \$48. This increase, which is to generate about half a million dollars—of which approximately \$150,000 has been targeted to supplement the IEEE General Fund's declining reserves—represents a 6.7-percent increase in the basic dues. For U.S. members whose special U.S. assessment of \$12 will not be increased, the percentage hike is about 5.3 percent. The special assessments of Canadian (Region 7) and European and African (Region 8) members will also remain unchanged.

In a series of related actions, the Board, during its summer meeting in San Francisco, also voted to:

- Increase by \$1 the discounted dues of first-year graduates, from \$23 to \$24.
- Increase the Affiliates fee by \$2, from \$20 to \$22. (Affiliates are members of other professional associations who wish to join an IEEE Technical Society because of a related professional interest but who are not IEEE members.)
- Increase the one-time entrance fee charged new members by \$5, from \$10 to \$15.

These actions came after six hours of close Board scrutiny of the IEEE budget and a debate that followed program presentations by each Vice President and other officers with major budgetary responsibilities.



PRESIDENT'S REPORT

by R. A. Sparks

Following the January MTT-S Administrative Committee meeting, the IEEE 1982 Conference on U. S. Technology Policy in Washington, D.C. was attended. The Society Presidents' Forum and Technical Activities Board meeting were held in the same time period, February 24-26. Reports on these events are included in the TAB meeting report by Charlie Rucker.

The Transnational Relations Committee (TRC) of IEEE met on the evening of 26 February and was attended in order to look into the process of forming a Microwave Study Group to visit the People's Republic of China in the Fall of 1983. Prior discussion of a Study Group had been raised with Professor Deng of the Hebei Semiconductor Research Institute following Bob Pucel's visit to PRC in November 1981. Approval was granted by the TRC to form a Study Group, with the understanding that all arrangements would be made by MTT-S. Further discussions on this matter were held with Professor Huang, Chairman of the Society of Microwaves, Chinese Institute of Electronics, at the Symposium in Dallas.

At the TRC meeting it was also mentioned that a delegation of IEEE Officers including the Chairman of the Technical Activities Board, Vice President Joe Cruz, and several Society Presidents would be visiting Region 10 in 1982. Plans are being made to depart for Tokyo on July 27 and return from New Delhi August 15. The MTT-S Administrative Committee approved supporting the participation of the MTT Society President in this visit.

There has been a request from the India Chapter Chairman to receive, by airmail, all announcements with deadlines such as meetings and Symposia notices, calls for papers, Fellow nominations, etc. because of the delays experienced in bulk mail deliveries.

A TAB Robotics Survey Committee questionnaire was responded to and the MTT-S Technical Committees Chairman, Bert Berson, referenced for further contact in following the development of robotics technology. Applications of robots to microwave manufacturing and test appear to be in the near term interests of the Society.

The Student Activities Committee has requested \$200 from each Society to support the 1981-82 Student Papers book. A copy of the 1979-80 book was received toward which a similar contribution had been made by the MTT-S last year. This request was approved to the MTT-S Administrative Committee in its June meeting.

As a member of the Continuing Education Committee of the Educational Activities Board (EAB), I have participated in several telephone conferences that have included the planning of

teleconferences in the Fall and early Winter. Subjects to be offered include a session on relays from MIPSYCON (a Power Society Regional Conference held in the Midwest) and Robotics.

The proposal by the United States Activities Board (USAB), to establish an IEEE Political Action Committee has created considerable discussion following its introduction at the February TAB meeting. At its June meeting, the MTT-S Administrative Committee decided that more information was required before it could endorse and sponsor the creation of an IEEE Political Action Committee.

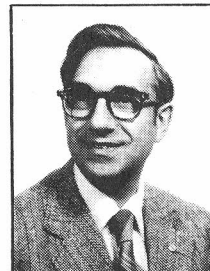


ADCOM TO MEET

The next meeting of the Administrative Committee of the Microwave Theory and Techniques Society is scheduled for October 18-19, 1982 at the Hyatt Regency Hotel in San Francisco, CA.



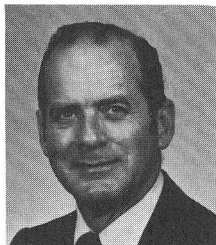
LEO YOUNG HONORED



Dr. Leo Young was elected an Honorary Life Member of the IEEE Microwave Theory and Techniques Society by a unanimous vote of the MTT-S Administrative Committee on 13 June 1982.

Honorary Life Membership is restricted to those members of the Society who have made long term technical contributions in microwaves, have performed outstanding service to the profession and the IEEE, and have been an elected member of the Administrative Committee. Dr. Young's long history of technical contributions, his status as an IEEE Fellow, and his service as MTT-S National Lecturer (1968), President of MTT-S Administrative Committee (1969), Executive Vice President (1979) and President (1980) of IEEE were cited as more than ample qualifications for Honorary Life Member. In addition, his efforts on establishing activities in IEEE for the betterment of our profession, including individual retirement plans, have been outstanding.

In being elected an Honorary Life Member of the Microwave Theory and Techniques Society, Dr. Young becomes the tenth individual so honored. The nine previous electees were: A. C. Beck, A. G. Clavier (deceased), S. B. Cohn, D. D. King, W. W. Mumford, A. A. Oliner, T. S. Saad, G. C. Southworth (deceased), and K. Tomiyasu.



ADCOM HIGHLIGHTS

by C. T. Rucker

In our last Newsletter, I predicted a superior Symposium in Dallas. It happened; starting with the Administrative Committee meeting on Sunday and Monday, continuing throughout the Symposium and ending with the Monolithic IC Symposium on Friday. Thanks Dallas; we hope you will invite us again soon. Your Adcom will meet next in October in San Francisco, the site of the 1984 Symposium.

As usual, the Symposium Adcom meeting was one of the year's busiest. A few of the more interesting reports and business items are summarized below:

Financial

MTT-S continues to be in excellent financial condition. IEEE recommends that Societies try to maintain a net worth equal to about one year's operating costs (\approx \$350,000 in our case). Jim Degenford reported that our net worth already exceeds \$500,000 leaving at least \$150,000 for discretionary use at this time. Furthermore, Symposium income and earnings on the invested portion of our net worth will continue to provide discretionary income of at least \$100,000 each year for the foreseeable future. Adcom is continuing to consider effective means of utilizing these funds for the best long term benefit of the membership. Proposals include:

- Scholarships,
- Selected free publications for MTT-S members,
- More financial assistance to Chapters,
- Grants to universities based on formal requests.

In addition to these, the "Microwave Engineering Foundation" mentioned in the last Newsletter is still being considered and, as you have probably noticed, the Newsletter has been expanded.

Transactions

Reinhard Knerr, Transactions Editor, will complete his tenure as Editor in December. Only a past Editor can appreciate the amount of work this job entails; but, we can and do thank Reinhard for a three year job well done.

Tatsuo Itoh of The University of Texas at Austin will formally assume the job of Editor in January of 1983. Informally, his tenure began in July of 1982. The early involvement insures an orderly transition between Editors.

During 1983 and 1984 you can look forward to special issues on Microwave and Millimeter Wave Monolithic Circuits, Millimeter Waves and Optical Waves. Of special interest in 1984 will be the Centennial Issue to be edited by MTT Historian Ted

Saad. Other special issues for 1984 will include Electromagnetic Wave Interactions with Biological Systems and Power and Low Noise GaAs FET Circuits and Applications.

Honorary Life Member

It is a pleasure to report that Dr. Leo Young was elected an Honorary Life Member of MTT-S at the June Meeting. The election recognizes his outstanding technical contributions to our field and his extraordinary service to our profession, our Society and to the IEEE. Honorary Life Members in MTT-S now number 10, including, in addition to Leo, A. C. Beck, S. B. Cohn, A. Clavier, D. D. King, W. W. Mumford, A. A. Oliner, T. S. Saad, G. Southworth and K. Tomiyasu.

National Lecturer

Dr. Ferdo Ivanek, 1981-1982 National Lecturer, reported twenty eight lectures already given. Before preparing his talk, Ferdo requested materials of interest from numerous countries and firms. His archives now include more than 200 slides; therefore, he reports, no two lectures have been the same. Ferdo is well within MTT-S budget because of financial support from his firm, Harris Corp. He has graciously agreed to extend his lectureship into 1983. Therefore, you still have a chance to invite his lecture to your Chapter and join the 1050 members who have taken advantage of the opportunity as of June. Ferdo can be reached at (415) 595-8732, extension 229.

Dr. Joseph A. Giordmaine of Bell Telephone Laboratories will be the 1982-1983 National Lecturer. He has entitled his talk *Integrated Optics* and has plans to emphasize monolithics, fibers, and some of the motivations for communicating by optical means. He is willing to tailor his talk to the needs of specific Chapters/Sections. So, when you contact him, be prepared to discuss a few details. You may write him at Bell Laboratories, 600 Mountain Ave., Murray Hill, N.J. 07974 or call (201) 582-2173.

PAC (Political Action Committee)

USAB, the United States Activities Board, has proposed formation of a Political Action Committee of the IEEE. The basic plan and a membership poll were discussed in the August issue of The Institute. After lengthy discussion, the feelings of Adcom appeared to lead to the nominal question: "Can there be a consensus on issues?" IEEE is composed of diverse individuals leading to the probability that many members would be offended by almost any political stand taken by the Institute. [For the USAB position, see USAB Report in this issue of the Newsletter. Ed.] Additionally, Adcom expressed concern that insufficient information was provided to make an intelligent decision. The MTT-S does not rule out PACs. Adcom instructed President Dick Sparks to inform the Technical Activities Board that it desired additional information prior to further discussions on the issue.

Other Items of Interest

- Adcom approved, in principal, the formation of Council on Lightwave Technology and authorized \$10,000 to support publication of a new Journal on Lightwave Technology.
- A payment of \$200 was authorized to assist with publication of student papers.
- An advance of \$1,000 was authorized for early expenses of the 1986 MTT-S Symposium Steering Committee.



THE IEEE MICROWAVE AND MILLIMETER-WAVE MONOLITHIC CIRCUITS SYMPOSIUM

by B. E. Spielman

This Year

The 1982 IEEE Microwave and Millimeter-wave Monolithic Circuits Symposium was held in Dallas, Texas on June 18, 1982 at the Hyatt Regency Hotel. This was the first such conference, but one which is to be held annually in conjunction with the IEEE MTT-S International Microwave Symposium. This monolithic circuits symposium is sponsored by the IEEE Microwave Theory and Techniques Society and is cooperatively sponsored by the IEEE Electron Devices Society.

This year's monolithic circuits symposium was well received. The conference had a total of four hundred and forty-seven (447) registrants. Original estimates for attendance ranged from a conservative figure of one hundred and seventy-five to an optimistic estimate of approximately three hundred registrants. Requests for additional digest copies numbered one hundred and six (106). Attendance at the conference reflected the international scope of the meeting with seventy-seven people coming from outside the United States. Informal feedback from attendees focused on two apparent attributes of the conference: 1) the papers presented were deemed to be of high quality, and 2) the order of paper presentation and grouping of papers was well conceived.

The composition of the conference is described as follows: A total of seventeen papers were presented, including one late paper. The first paper was an invited contribution which summarized and discussed commercial applications of the technology. The papers in the morning session then moved from a paper on direct broadcasting satellite receiver technology through amplifier- and oscillator-related papers, with the final two morning-session papers addressing millimeter-wave-related technology. The final morning paper was a brief late paper treating a DC to 2 GHz monolithic amplifier.

The afternoon session commenced with a circuit processing-related paper, contained papers on test fixtures, switches, phase detectors/hybrids and A/D ICs, and culminated with papers on fabrication aspects of monolithic VCOs and a two-state monolithic amplifier employing a high dielectric constant capacitor. Five papers were contributed from outside the United States.

Additional activity associated with the conference involves the publishing of reviewed, expanded versions of conference papers in the IEEE MTT-S Transactions and/or the IEEE ED-S Transactions. At this writing, it is anticipated that six of these papers will be published in the January 1983 issue of the IEEE Transactions on Microwave Theory and Techniques.

Next Year

The 1983 IEEE Microwave and Millimeter-wave Monolithic Circuits Symposium will be held in Boston, Massachusetts. That conference will expand to 1½ days in the following fashion: The first day of the conference will occur on Tuesday, May 31, 1983 and will run the full day. On Wednesday, June 1, 1983, the half session will be held during the morning and will be jointly fielded by the 1983 IEEE Microwave and Millimeter-wave Monolithic Circuits Symposium and the 1983 IEEE MTT-S International Microwave Symposium. Again a digest of complete papers will be made available with expanded versions of reviewed contributions being published in the IEEE MTT-S Transactions and/or the IEEE ED-S Transactions.



NATIONALIZE IEEE?

An amendment that, if passed, would make the IEEE a national organization and limit its operations to the United States will appear on the 1982 ballot. This "Americanization" petition, circulated by self-proclaimed IEEE gadfly Irwin Feerst, obtained over 800 signatures by the May 28 deadline, more than the 596 (one third of 1 percent of the IEEE's total membership) necessary to place the amendment on the ballot.

The amendment proposes changing Article 1, Section 3, of the IEEE constitution to read, "The character of its [the IEEE's] scope is national and the territory in which all its operations and meetings are to be conducted is the United States of America," from its current wording, "The character of its scope is transnational and the territory in which its operations are to be conducted is the entire world."

At its May meeting here, the IEEE Board of Directors voted to oppose the amendment and instructed the Executive Committee to prepare a statement in opposition on behalf of the Board for inclusion in the 1982 ballot mailing.

1983 IEEE/MTT-S

International Microwave Symposium

Sheraton—Boston Hotel, Boston, Massachusetts
June 1, 2, 3, 1983



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ADVANCED

FIRST CALL FOR PAPERS

The 1983 IEEE MTT-S International Microwave Symposium will be held on June 1-3, 1983 at the Sheraton-Boston Hotel. The technical program will consist of both regular and exhibit (or poster) sessions. In the latter authors have the opportunity not only to present conventional theoretical and experimental information, but also hardware for inspection on passive or active display. Prospective authors are invited to indicate if they have a preference for either regular or exhibit sessions. All accepted papers in either category will be published in the Symposium Digest.

Papers are solicited describing original work in the microwave field. A list of suggested topics is given below, but papers concerned with other aspects of microwave technology will be considered.

- Solid State Devices and Circuits
- GaAs Monolithic Circuits
- Filters and Multiplexers
- Passive Components
- Microwave and Millimetre-Wave Integrated Circuits
- Ferrite Devices
- Low Noise Techniques
- Field Theory
- Microwave Systems
- High Power Devices
- Gigabit Logic Devices & Systems
- Communications Systems
- Microwave Acoustics
- Integrated Optics, Fiber Optics and Optical Techniques
- Submillimetre Wave Techniques and Devices
- Microwave Measurement Theory and Techniques
- Microwave Bioeffects & Medical Applications

Authors are requested to submit a 500-1000 word summary with an abstract clearly explaining their contribution, its originality, and relative importance. Six copies of the summaries must be received on or before December 10, 1982 by

Dr. Ralph Levy, Chairman TPC
Microwave Development Labs., Inc.
135 Crescent Road
Needham Heights, MA 02194, U.S.A

Authors will be notified of the status of their contributions by February 11, 1983. Authors of accepted papers will receive copyright release forms and instructions for publication and presentation.



FOOD FOR THOUGHT

The following is the text of a letter from Al Clavin, former MTT-S President, to our current Adcom President Dick Sparks. It is dated 21 June 1982, the Monday immediately following the 1982 MTT-S Symposium and only one week after the most recent Adcom meeting. Al's letter is reprinted here with minor alterations and his permission as additional "food for thought" in determining the judicious use of our expanding Society surplus.

MTT-S Surplus Dollars

I felt it unfortunate that I was unable to attend some of the earlier Adcom meetings, especially those concerned with plans for handling our surplus dollars. At the meeting I asked for a shopping list and found, in my opinion, that most of the items were poor. They ranged from

- 1) Self-serving (scholarships to MTT-S members)
- 2) Accomplished by someone else (reprint papers a la Artech House or IEEE Press)
- 3) Controversial (send a free book to all members of MTT).

Only one idea seemed to make sense to me and that is the educational video tape concerning the effects of radiation on biological specimens. This could have significant impact for all MTT members. The problem is not the making of the film, however; it is the distribution (what do we do with it after we have it?).

Fred Rosenbaum's "Microwave Foundation" [Covered by a separate article in this edition of the Newsletter. Ed.] is certainly in a different class. My feeling is that MTT-S will receive approximately \$100,000 a year in additional surplus. That is insufficient funds to accomplish the needs of the Microwave Foundation. Fred seems to feel he can solicit additional industry support. As discussed at the Adcom meeting, I think he is in for great difficulty due to the feeling of loss of control by the industries, breaking the log jam of established industrial procedures, and, eventually, administrative costs.

Fred cannot proceed with fighting the windmills until he gets Adcom to agree that he can have the \$100,000. At best, we should only give him this kind of funding on the basis that he can match it or perhaps twice match it. If he is unsuccessful, all moneys should be refunded. The attempt would have to be planned through grass roots efforts within each Chapter of MTT and should be completed within one year.

We have talked about scholarships. Most industrial concerns have many graduate scholarship programs. Very few undergraduate scholarships are available. Perhaps this is an area where we can make significant contributions and get young people to be interested in a microwave career at an early age. The moneys per individual would be small and therefore we could make a 4-year commitment assuming the student maintained a spe-

cified grade point average. Two to three thousand dollars per year should be sufficient for undergraduates.

I would like to suggest that each member of Adcom make up his own shopping list of ideas for soundly investing the surplus moneys and that they have them ready for discussion by the next meeting. We have all had a long time to think about the problem, perhaps something new will surface. I feel this is the most urgent and pressing problem that Adcom has to face.

Editor's Note

Adcom would also like your "shopping list" and your inputs in assisting them in using the MTT-S surplus wisely. Take two minutes and complete the pre-addressed, postage paid reply card. Remember, you helped to generate the surplus and should have a say in its disbursal. Ed.



MTT-S MEMBERS RUN FOR IEEE OFFICES

The IEEE's Board of Directors, for the first time, has nominated two candidates for each of the 1983 President-Elect and Executive Vice President offices. The Board's nominees for President-Elect are Dr. Richard J. Gowen (F) and Dr. Donald D. King (F).

Dr. King, President of Philips Laboratories, Briarcliff Manor, New York was a founding member and Chairman of the Microwave Theory and Techniques Society from July 1963 through June 1964. He was also Editor of the Transactions on Microwave Theory and Techniques from April 1959 through November 1962.

For Executive Vice President, the nominees of the IEEE's Board of Directors are Mr. Charles A. Eldon (SM), Corporate Manager for Capital Equipment, Hewlett-Packard Company, Palo Alto, California and Dr. Allan C. Schell (F), Director, Electromagnetic Sciences Division, Rome Air Development Center, Hanscom Air Force Base, Bedford, Massachusetts and current IEEE Division IV Director.

Since Allan Schell is a candidate for Executive Vice President of IEEE, he will not be a candidate for re-election to the office of Division IV Director. Instead, the two nominees are Dr. Emerson W. Pugh, IBM Corporation, Thomas J. Watson Research Center, Yorktown Heights, New York and Dr. Lawrence R. Whicker (F), Head of the Microwave Technology Branch, Naval Research Laboratory, Washington, D.C. Dr. Whicker was President of the Microwave Theory and Techniques Society in 1978.

GUIDE TO ETHICS

USAB, the United States Activities Board, has published a guide to ethics entitled **The IEEE Role in Engineering Ethics**. It is the third in a series of "PAC Guides" to provide information and guidance to members on professional topics.

The ethics guide discusses the IEEE Code of Ethics and the procedures for enforcing the Code, including IEEE support for members placed in jeopardy for adhering to the Code, and discipline of members for Code violations. Another section of the guide discusses the anatomy of ethical decisions and includes two recent case studies of IEEE involvement. Finally, the guide presents a number of activities that may be undertaken by local Professional Activities Committees (PACs), pointing out the USAB resources available to PACs.

Copies of the **PAC Guide to Ethics** are available from the IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. The price is \$2.25 for members and \$3 for nonmembers. Ask for IEEE Catalog No. UH0149-5.



RETIREMENT PLANS

As you know, the IEEE has been working hard over the past several years to obtain improved retirement plan benefits for all electrical and electronics engineers, regardless of any IEEE affiliation. The IEEE lobbied actively for a change in the laws governing Individual Retirement Accounts (IRAs) and Keogh Plans, retirement plans for self-employed individuals. With the passage of the 1981 tax law changes, it is now possible for individuals to adopt an IRA even if said individual is already participating in an employer's qualified retirement plan or his own Keogh plan.

The IEEE recently explored in depth the possibility of sponsoring a special retirement program for its members. In view of the broad spectrum of plans that are now available to the public through banks, investment companies, and other financial institutions, the IEEE determined that no special advantages would have been gained if the IEEE sponsored its own plans.

However, as a service to its members, the IEEE Individual Benefits and Services Committee (with the assistance of the Smith-Sternau Organization, Inc., administrators of the Group Insurance Program for IEEE members since 1961) has undertaken an in-depth review of many of the retirement plan programs that are available. As a consequence of that study, the IEEE has determined that two very good programs are those sponsored

by the Dreyfus Service Corporation and T. Rowe Price Marketing, Inc., and has made arrangements for members to receive information about the plans sponsored by these organizations.

Through these plans, IEEE members have the opportunity to select investments in no-load mutual funds with various investment objectives, ranging from conservative income-oriented funds to more speculative growth-oriented funds. As your investment goals change, you may switch investments from one fund to another with a specific sponsoring organization. In the case of some of the funds that are available, the IEEE has negotiated for its members (and their spouses) reduced minimum initial contributions and reduced annual custodian fees.

A brochure is available from the IEEE Individual Benefits and Services Committee, which briefly describes the plans that are offered. For more information write IEEE, 1707 L Street N.W., Suite 700, Washington, D.C. 20036 or call (800) 424-9883. In the Washington, D.C. area, call (202) 296-8030.

T. Rowe Price Marketing, Inc. is offering six different funds. As a special consideration to IEEE members and their spouses, the initial investment minimum for the first fund selected is \$250. Initial investments to any additional Price fund(s) would be \$500. Subsequent investments to existing Price fund accounts would be \$50 for IEEE members. The only exception to these minimums is the T. Rowe Price International Fund which requires an initial investment of \$5,000 and subsequent investments of \$1,000. The only cost or fee for establishing and maintaining a Price IRA or Keogh Plan is the annual custodian fee of \$3 per year on each fund being held by T. Rowe Price Marketing. The same \$3 is charged for a special account. T. Rowe Price toll-free telephone numbers are (800) 638-5660 and (800) 492-1976 (in Maryland).

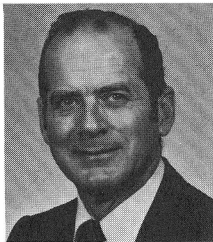
Dreyfus Service Corporation is also offering six separate funds which can be used for Keogh or IRA accounts. Most of the Dreyfus funds require a minimum \$2500 investment. Additional investments can be made in amounts of \$100 or more. The Bank of New York, as custodian for the retirement funds through Dreyfus, charges a one-time sign-up fee of \$5 and an annual maintenance fee of \$2.50 per account. All of the Dreyfus funds charge management fees and expenses and the mutual funds charge a sales commission on the purchase of shares. Information on charges is contained in each fund prospectus. Outside of New York, you can call Dreyfus for information at (800) 223-0982. Within New York state, call (212) 489-4900 collect.

Remember, starting in 1982 if you are self-employed or have self-employment income, you will be able to supplement your Keogh investment (15 percent of 1982 earnings or \$15,000, whichever is less) with tax-deductible contributions to an Individual Retirement Account. The \$2,000 you may invest in an IRA in no way affects the amount you may invest in a separate Keogh Plan.

WOMEN AND MINORITIES IN ENGINEERING

The number of women scientists and engineers employed in the United States increased almost 32 percent between 1974 and 1978, but that increase only brought their share of the science and engineering work force to 9.4 percent. This is a low participation rate considering that women constituted over 40 percent of all professional and related workers in 1978, according to a study by the National Science Foundation. Salaries of women scientists and engineers came to about 80 percent of what men earned, the report says.

The report also shows that the employment of minority scientists and engineers rose almost 25 percent, to 39,000, from 1974 to 1978, but this only increased their share of the science and engineering work force to 4 percent, with blacks representing 1.6 percent of that work force.



TAB HIGHLIGHTS

by C. T. Rucker

The February Technical Activities Board (TAB) meeting was held at the Mayflower Hotel in Washington, D.C., in conjunction with the IEEE 1982 Conference on U.S. Technology Policy. The Society Presidents Forum was also convened at that time. This report summarizes the activities that are relevant to the interests of MTT-S members.

Society Presidents Forum — Feb. 24

The Forum was chaired by Dr. Richard Emberson and covered a wide range of subjects raised by the attendees. There was discussion to create a Robotics Council in which each Society with an interest would have a representative. While current robots are not playing a significant role in the microwave field, it is conceivable that automation of fabrication and test equipment will employ second and third generation robots that will be of importance to the microwave community. The development of this field should be followed by our Technical Committees.

A report on the status of and progress in formulating an Optical Communications Journal was given together with an invitation to provide representatives.

TAB Meeting — February 26

The meeting was chaired by Dr. Jose B. Cruz, Jr., newly elected Vice President of the Technical Activities Board.

A proposed Educational Activities Board (EAB) position paper on engineering education was introduced and the motion to support this undertaking was passed unanimously.

In view of the increasing Society memberships in Regions 7-10 and the increased technical activities taking place, it was proposed that at least one yearly meeting be held in one of those regions. A motion was passed that a delegation be formed through the Transnational Relations Committee to visit Region 10 during 1982. All Society Presidents would be invited to participate.

The formation of a Council on Fiber Optics was approved and MTT-S is represented by R. H. Knerr and F. J. Rosenbaum.

The subject of reimbursement to the general fund by Societies and Councils for accounting and administrative services was discussed again at some length. The initial \$170K assessment for 1982 is projected to approach \$800K in 1985. The detailed information concerning the costs and charges for services to the Societies and Councils has yet to be provided by the Headquarters Staff. T. Bartlett, IEEE Controller, is to address this issue and report to the TAB Operating Committee in May.

The issue on restructuring the seven technical divisions into ten is not resolved and continues to be studied by the Long Range Planning Committee.



IEEE/USSR — NYET!

The IEEE Board of Directors has voted against reconsidering a 1980 suspension of official exchanges between the IEEE and the Soviet Union's Popov Society.

The suspension was based on the banishment of the Nobel-prize-winning Soviet physicist Andrei Sakharov and the Soviet invasion of Afghanistan.

The directors voted 18 to 8 against reconsidering the ban on official exchanges, but indicated that they encouraged individual involvement with USSR engineers and scientists because such involvement does not constitute an endorsement of that country's activity. Board members indicated that the Soviet Union's behavior in Poland shows that the original reasons for ending official relations are still valid. Also, the members suggested that the Popov Society had been the real beneficiary of past exchanges and that benefit to the IEEE had been minuscule.

PROPOSAL FOR A MICROWAVE ENGINEERING FOUNDATION



by F. J. Rosenbaum

Preamble

In the past decade there has been a significant increase in the range and scope of the applications of microwaves. This has been paralleled by unprecedented growth and strength of the microwave industry. However, several circumstances have arisen which threaten the long term vitality of the microwave field in the United States. These include difficulty in attracting entry level engineers to the field, a shortage of trained microwave engineers and technicians, increased cost of microwave systems, extended delivery time for microwave products, the rise of competing technologies and of international suppliers, and a marked decline in expenditures for basic and applied research.

Many of these issues are interrelated and may be analyzed by focusing on the educational component of the microwave industry. In order to attract undergraduate engineering students to the microwave field requires an increase in the professional visibility of the microwave engineer. This visibility is enhanced by strong graduate research programs at universities. Thus, one aspect of the problem of a steady, adequate supply of entry level manpower is the development of an adequate, self-sustaining, university based educational activity in the microwave field. This presupposes a well trained, current and energetic faculty. An appropriate supply of entry level people would, over a period of time, sustain the growth of the industry, shorten delivery times, and help keep the cost of microwave products competitive. Likewise, the increased manpower, and the research and development activities that graduate students experience, would contribute to the growth and scope of the field.

Universities presently are not equipped to bring forth effective solutions to graduate and undergraduate microwave education problems on their own. Few professors are capable of training the next generation of microwave engineers and many are themselves aging and are nearing retirement. Microwave laboratories in even the best qualified schools do not contain modern equipment suited to present industrial procedures and practices, and the curricula around which microwave engineers receive their basic training are in need of substantial upgrading.

Despite the importance of the problem, little has been done by anyone to address its various facets and nothing at all has been done in a *collective* way. The seriousness of the situation, its widespread nature, and its potential dramatic im-

pact on the future of the microwave field require some collective action on the part of the microwave community. Since it is difficult for industrial or university groups by themselves to address problems of national scope, it is appropriate for the MTT Society itself, which already provides collective technical leadership in this field, to undertake this obligation as promptly and energetically as possible.

As a vehicle to address and present solutions to problems in the area of microwave education we propose the formation of a . . .

MICROWAVE ENGINEERING FOUNDATION.

What follows is one plan for such an institution.

Purpose

To enhance and support educational and career opportunities in the microwave field.

Organizations

The Microwave Engineering Foundations would be incorporated as a not-for-profit, private educational foundation. It would be supported by industrial contributions, private gifts, and by MTT-S. It would be affiliated with MTT-S, possibly by means of representation on a Board of Governors. Financial administration could be done through IEEE Headquarters.

Funds would be solicited from the private sector of the microwave industry on an on-going basis. The funds would be used either for endowment or to support current programs. For example, present exhibitors at the International Microwave Symposium might be asked to participate at the level of say \$10K/yr. There would be a tax benefit to the companies either as a charitable contribution or as a tax credit for research investment. As a symbol of its commitment, MTT-S could either endow the Foundation with a lump sum, say \$100K and/or commit an annual \$10K gift to support the activity. Alternative formulas for industrial involvement, based on their sales in the microwave area, gross sales, etc. could be developed.

Funds would be expended to:

- a) Stimulate undergraduate education in microwaves, RF, analog, device and systems areas.
- b) Increase the number and quality of graduate students in these areas through scholarships and grants-in-aid.
- c) Improve the quality of instruction.
- d) Facilitate continuing education including Fellowships for Continuing Study by faculty members to industry/governmental organizations.
- e) Facilitate implementation of the sabbatical concept for engineers in government/industry/university at the appropriate institutions.
- f) Develop microwave curriculum materials, video tapes, lab experiments, books, etc.
- g) Support seed grants for equipment and/or research.

Some of these areas deserve more discussion.

- a) Undergraduate students interest could be

excited by making available stimulating courses, particularly laboratory experiences. Along these lines, the Foundation could develop a Summer Intern Program whereby qualified undergraduates could be placed as summer employees in the microwave industry. The key to making these programs work is the presence of a campus faculty member interested in or devoted to microwaves. Visiting speakers, such as the MTT-S National Lecturer can also have an impact on undergraduate student interest in the field.

b) The problem of low student interest in full time graduate study is often a financial one. Stipends are quite low when compared to full time industrial salaries. Also the student feels that by holding himself off the job market for from two-to-four years he will place himself far behind his fellows who have gained on-the-job experience, seniority, and steady raises. One way to combat this would be to offer the graduate student a stipend roughly equivalent to an industrial salary rate, say one-half the full-time salary for half-time work. Although universities do their best to be competitive for students, due to a variety of reasons they are seldom able to rise to this standard. Thus, one way the Foundation could help is to make available funds, under a program, which could augment existing university funds to raise the stipend to an acceptable level.

Other approaches here could include outright scholarships and the support of selected (seed) research programs. (See g.)

c, d, & e) A key element in attracting and training good students is qualified faculty. Steps can be taken to make the faculty's job easier. First rate lab equipment and improved course materials would be helpful. Also, up-grading faculty by exposing them to current industrial practices is important. Thus, a summer job program akin to the Student Internship (see a) could have positive effects.

Likewise, a program of sabbatical leave from university to industry/government and *vice versa*, could prove very effective. A prestigious national organization, such as the Foundation, could lead the way in making the concept viable, particularly to industry and the Federal Government. One significant aspect of this is that it would offer a career development opportunity to the practicing engineer which could be important in keeping senior people vitalized and committed to the field. The existence of the Foundation, acting as a clearinghouse, and providing leadership could make such a program credible.

f) Curriculum projects such as textbooks and lab manuals, the production of video tapes, etc., could be underwritten by the Foundation.

g) Instructional laboratory equipment, and, in some special cases, seed money for research could also be part of the Foundation's program.

Operations

The Foundation policy would be set by a twelve man Board of Directors which would include representatives from MTT-S, academe, industry, and government. It would be administered by an Executive Director and Secretary with staff assistance

provided by IEEE Headquarters. The Foundation would **NOT** be an entity of the IEEE but affiliated with it.

The Foundation's activities would have two stimulants, one generated by the Board and staff, the other in response to external proposals. Committees of the Board would be designated to administer the various programs. Proposals would be reviewed on a periodic basis. Awards could be made yearly and announced at the annual MTT-S International Microwave Symposium.

In order to have a significant impact, and so as not to dilute the use of the limited funds available for these efforts, it is proposed that a policy be established that gives preference to those schools that have a demonstrated microwave activity, or whose proposals demonstrate a high probability of generating a significant program.

The Foundation approach presents to MTT-S a significant vehicle for the use of some of its surplus funds. An initial contribution of perhaps \$100K, and an annual endowment commitment of say \$10K/yr. would provide an important base for the solicitation of funds from industry. It also has the advantage of relieving MTT-S of the complexities of dealing with requests for support, proposals, etc., in a piecemeal and discontinuous way, while at the same time demonstrating MTT-S commitment to the long-term growth of the microwave field.

What's In It For Industry?

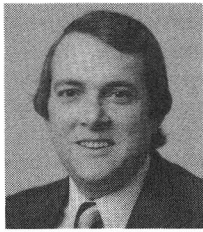
1. Industrial contributors would be prominently featured in letterheads, advertisements, literature, etc., which would give them visibility in undergraduate and graduate recruiting on the national level.
2. Resumes of students from participating institutions, research reports, pre-prints, etc., would be communicated to contributing organizations.
3. The pool of trained entry level people at the B.S., M.S. and Ph.D. levels would be impacted in a significant way.
4. The training of these entry level people would be broader than those who participate in internal corporate programs (a different set of slogans).
5. The costs are shared and thereby kept nominal.
6. There is a tax benefit as a charitable contribution or tax credit for research investment.
7. The Foundation could provide the nucleus for a microwave industry trade organization.
8. The present chaotic recruiting situation would be eased by this program which will have national impact, rather than a regional one.

What's In It For the MTT Member?

1. The growth of the manpower pool will be managed by this activity in an orderly fashion.
2. The existence of the Foundation improves the professional stature of the microwave

(continued on page 12)

MTT-S MEMBERSHIP AWARDS



by E. C. Niehenke

At the Annual Awards Banquet, held June 16, 1982 in conjunction with the 1982 IEEE MTT-S International Microwave Symposium, two awards for increased membership were presented to the Chapter Chairmen, or their representatives, from the India Chapter and the Central Illinois Chapter of MTT-S. The India Chapter showed a 32.4 percent membership increase from July 31, 1981 through March 31, 1982. During the same period, the membership of the Central Illinois Chapter increased by 22.5%. Congratulations!



FOUNDATION (continued from page 11)

- engineer in the eyes of his organization.
3. Foundation programs would provide a mechanism for retraining, up-grading, sabbaticals, etc., for the practicing microwave engineer.
 4. Manpower needed for the long-term growth and vitality of the field would be forthcoming.

Concluding Comments

The MTT-S Adcom has been debating the issue of proper use of its budget surplus for the benefit of its members and the microwave industry at large. Many ideas have been discussed at recent Adcom meetings. One of the most ambitious and potentially far reaching has been presented here. The Microwave Engineering Foundation is intended to raise the stature of microwave engineers, impact the education and number of new microwave engineers, and to serve as a nucleus for a microwave industry trade organization.

In order to be successful, it would have to attract a wide base of support from the MTT-S membership and the microwave industry leaders. Please consider whether you could embrace such an organization. The details are not all worked out and there are still some flaws in the plan. However, if you think the idea is worthwhile, please indicate your support for (or opposition to) it by communicating directly with me (Washington University, Department of Electrical Engineering, Campus Box 1127, St. Louis, MO 63130, (314) 889-6157) and/or using the preaddressed, postage-paid reply card attached in this Newsletter. With your help, we can create an entity which can benefit us and our industry in an important way.

MICROSTRIP ANTENNAS

I. J. Bahl and P. Bhartia are the authors of **Microstrip Antennas**, published in 1980 by Artech House, Inc., Dedham, Massachusetts, and available for \$40. The book has been reviewed by Keith R. Carver, NASA Headquarters, Washington, D.C. 20546.

This new book on microstrip antennas is one of two published which deal exclusively with microstrip radiators and microstrip arrays. The authors have divided this 348 page volume into seven chapters and three appendices, and have pulled together a great deal of material from the published literature on various microstrip radiator theory, microstrip elements and microstrip arrays. This is clearly not a textbook, as the authors claim, but is instead a reference book for a design engineer who wants to avoid digging through the diverse literature on microstrip antennas. Even if there were a university requirement for a full semester's treatment on microstrip antennas, this book would leave a student with some confused notions about what is important in microstrip antenna design and what is extraneous. The authors make the mistake in the first couple of chapters of proceeding from the general to the specific, so that the reader must suffer through the mathematical liturgy of vector potential theory, Green's functions and other timeless incantations before finally being told of the simple antenna physics which characterizes the most commonly used microstrip antennas. In fact, a great deal of extraneous and useless mathematics is presented in the front portion of the book which, although perhaps intended as a gesture to the author's research peers, obscures those really useful ideas which are buried within. This mathematical posturing gives the impression that somehow a rigorous, self-consistent analytical presentation is being offered. In fact, there is not at present a single rigorous theory of microstrip antennas which can be used for all geometrics and which works for all substrate thicknesses. Moreover, there is probably no real need for such rigor, since it has been found by most successful microstrip antenna designers that a good mixture of approximate theories and a sharp Exacto knife can lead to satisfactory results. As an example, section 1.2.2 (Radiation Fields of Microstrip Antennas) presents a sequence of 32 equations which formalize the calculation of the antenna pattern (the generality of which would presumably be used in subsequent chapters), all of which can be found in almost any good textbook on antenna theory. But these equations are not used in subsequent chapters, so that the relatively simple calculations of the far-zone fields of a microstrip patch are obscured in a dense cloud of mathematical smoke!

The latter part of chapter 2 on rectangular microstrip antennas is a useful treatment. However, the authors begin the chapter by proceeding from the general to the specific, starting with the vector potential method and the dyadic Green's

function, then admitting that the vector potential approach leads to a "solution" which although rigorous is "unattractive due to a lack of closed form expressions." The presentation of the Green's function concludes with a belated observation that the method "is also mathematically cumbersome and does not lend itself to tractable analysis." One wonders why these two methods are presented at all.

From section 2.2.4 on, however, a number of very useful design techniques are presented, including the radiating aperture method, the cavity model and model expansion technique, and the transmission line model. Section 2.3 presents a design procedure for rectangular microstrip antennas, which starts with zeroth-order expressions for choosing the patch width and length and then gives specific expressions for the radiation pattern, the radiation resistance, the Q, antenna efficiency, bandwidth and gain. The reader is cautioned that the given expression for the gain predicts values higher than those actually measured for single patches, this being due to the assumption of an infinite perfectly conducting ground plane.

Section 2.5 discusses several methods for obtaining circular polarization from a rectangular patch, as well as omnidirectional patterns from spiral microstrip radiators at UHF. A very good discussion is given in section 2.5.4 on the design of microstrip radomes and the effect of icing, this being the result of the author's own research.

Chapter 3 discusses circular microstrip patches and is generally laid out more coherently than chapter 2. The authors emphasize the cavity model and include the effect of the source. They downplay the Green's function technique. Analyses of the half-disk patch and the microstrip ring antenna are included. Section 3.5 presents a very useful design procedure for circular disk antennas, in a manner analogous to that presented in chapter 2 for rectangular patches.

Chapter 4, mainly on triangular and pentagonal patch elements, can be omitted by most readers who are beginning to study microstrip antenna design. Although the pentagonal patch was originally developed to provide circular polarization with a single feedpoint, it has been replaced by other simpler patch shapes and stands as an object of mathematical curiosity. The triangular patch is probably of more eventual interest, since it has the potential of providing more bandwidth than rectangular or circular patches. Section 4.3.3 on elliptical patches points out that a nearly-circular patch with the proper ellipticity can be designed to produce circular polarization in much the same way that a nearly square patch can. In both of these cases, the dual mode degeneracy is removed so that two spatially orthogonal E-vector components in time-phase quadrature are produced.

Chapter 5 is a good presentation of travelling wave microstrip radiators, including the chain antenna, the TEM line antenna, series-fed arrays of microstrip patches, comb-line antennas, and a Franklin-type antenna. The emphasis here is on

practical design methods, as opposed to mathematical rigor.

Microstrip slot antennas are reviewed in chapter 6, and are distinguished from stripline or triplate slot antennas in that microstrip slot radiators use only two parallel conducting layers. Both narrow and wide rectangular slots are discussed, along with a good review of their radiation pattern and input impedance characteristics. Tapered slotline and annular slot radiators are also presented. Table 6.1 presents a particularly useful comparison of microstrip patch and slot antennas.

The concluding chapter 7 is on microstrip antenna arrays and presents a review of applicable array theory as well as a good sampling of practical linear and planar microstrip arrays that have been built and tested. Section 7.3 on electronically scanned microstrip arrays include a particularly useful discussion of the formalism for including mutual coupling effects in the prediction of the behavior of scanned arrays as well as a summary of some measured mutual coupling levels for both rectangular and circular patches. Measured performance characteristics are given for several practical phased arrays of microstrip antennas.

The authors are not as careful as they should have been in referencing which figures are theirs and which are paraphrased or copied from the work of other authors. As examples, figures 1-4 (D), 2-7 and others are directly copied from publications by this reviewer, figure 2-21 is the work of John Kerr, figure 4-12(A) is due to Henry Weinschel and figure 4-13 is due to Buddy Coffey. All of these authors are referenced in the text, but credit is not always properly given in the figures.

In conclusion, chapters 2-7 of this volume constitute a useful desk reference for a microstrip antenna designer. The book is not suitable as a textbook since a great deal of extraneous mathematics in the first chapters obscures the fundamental principles.

(Reprinted from Antennas and Propagation Society Newsletter, Volume 24, Number 2, April 1982)



HERTZ DISCOUNT INCREASED

The car rental discount offered by the Hertz Corporation to IEEE members and members of other societies belonging to the American Association of Engineering Societies has been increased from ten percent to 13 percent.

The discount applies to standard unlimited mileage rates and to weekly and monthly economy fares previously excluded from discount rates. It applies to rentals for both business or pleasure.

IEEE members can receive this discount by showing their IEEE membership card and mentioning that the IEEE is an AAES member society.

NEW BOOKS

The thirteenth in the IEE Series on Electromagnetic Waves, **Energy in Electromagnetism**, has recently been released. The 384 page book was written by Henry G. Booker of the University of California, and is available through the IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854 (ISBN 0-906048-59-1) for \$75.

The 62nd Edition of the **Handbook of Chemistry and Physics** is now available from CRC Press, Inc., 2000 Northwest 24th Street, Boca Raton, FL 33431 for \$59.95. Published continuously since 1914, this handbook has been regularly updated in keeping with changing requirements. For instance, this 2300 page edition includes mathematical information not commonly available in most calculators, such as Bessel functions, Gamma functions, error functions, and Fourier transforms. Also, many new tables have been added.

The 1982 edition of the **Radio Amateur's Handbook**, updated to reflect changes in digital communication techniques and others aspects of RF communication, is available from the American Radio Relay League. Among the new material in the 1982 edition is an updated spectrum chart, packet-radio and spread spectrum techniques, new antennas for VHF, and a revised parts-supplier list. The new projects include a code practice oscillator, a two-tone generator, a high performance single-sideband speech processor, an eight band communications receiver, a simple switching-regulator power supply, and a 50 MHz transmitting converter. The cloth edition costs \$15.75 in the U.S. and \$18 elsewhere. The paper-bound edition is available for \$10 in the U.S., \$11 in Canada, and \$12.50 elsewhere, from the American Radio Relay League, Newington, CT 06111, (203) 666-1541.



FELLOWS LIST INCOMPLETE

A close check of the list of MTT-S sponsored Fellows of the IEEE which appeared in the Winter 1981 issue of the MTT-S Newsletter (number 102) revealed that thirteen names were missing. They are:

- | | |
|----------------|----------------|
| J. S. Hill | N. Kumagai |
| I. Kaufman | W. H. Kummer |
| J. J. Kelleher | N. S. Nahman |
| H. Kimura | L. S. Nergaard |
| A. P. King | J. Nishizawa |
| H. W. Koenig | T. Nomura |
| Y. Konishi | |

Your Newsletter Editor sincerely regrets these omissions.

THE 1981-82 MTT-S NATIONAL LECTURE

by F. Ivanek

Business obligations prevented me from starting the lecture series in 1981, but I was in a position to respond to all but a couple of invitations during the January through June, 1982 period as shown in the attached table.

Out of the 28 lectures, 21 were hosted by MTT, MTT/AP or MTT/ED Chapters. AES, COM, ED, Student and other Chapters joined in 9 of these meetings. Other IEEE hosts included 3 Student Chapters, 2 Sections, and the International Symposium on Circuits and Systems held in Rome, Italy. Of special importance was the invitation by the Consultative Committee on Radio Communications (CCIR) of the International Telecommunication Union (ITU). They organized a joint meeting with the Swiss IEEE Section. The only non-IEEE host organization was the Italian Electro-technical Society, Milan, Italy, but IEEE and MTT members accounted for a substantial portion of the audience.

Attendance varied according to the members' interests, scheduling and location convenience, promotion, and other factors of consequence. The attendance figures reported by the individual organizers add up to 1128 for the 28 lectures, resulting in an average attendance of 40 per lecture.

This lecture series was, and continues to be, a most rewarding experience for me. It started with the overwhelming response to my solicitation for inputs and slides, which I included in the MTT-S Newsletter announcement. I received a great deal of technical information and well over 200 slides! This made it possible to change the lecture's content to suit the particular audience profile, as predicted by the host. Actually, in only two cases did I find it possible to repeat a previous lecture. Naturally, this made my job much more interesting.

While I have used all significant contributed material in one version of the lecture or another, I feel the obligation to give a more complete presentation in my invited paper for the MTT Transactions. The magnitude of this endeavor prevented me from keeping the optimistic promise given to Reinhard Knerr, Editor of the MTT Transactions. He kindly gave me consecutive extensions until the end of his term as Editor, but I was unable to make a commitment within this time frame.

The MTT Transactions paper and the remaining invitations to present my lecture constitute my commitment for the coming year. I have tentatively scheduled 1982 presentations to the Florida West Coast MTT-S Chapter and to the Central Texas Section. **I will be glad to accommodate any additional interested MTT-S Chapters or other groups, until mid-1983**, in accordance with Adcom's decision to extend the National Lecture sponsorship to overlapping two-year terms. The extension of the lectureship is naturally subject

to my employer's consent. Invitations or inquiries from abroad include Brazil, France, Japan, Norway, Yugoslavia, and the People's Republic of China.

In thinking of observations and suggestions for the future, there are two I would like to put forward at this time. Firstly, joint meetings with Chapters whose members share the MTT's interest in the subject of the National Lecture are particularly rewarding and should be given high preference over separate MTT-S Chapter presentations. Secondly, student audiences impressed me by their lively interest in information that sheds light on their future careers. There is hardly a better way to promote the long-term growth of the

MTT Society than through closer and more frequent interaction with Student Chapters. I see the MTT-S National Lecture as one of the best platforms for such interaction.

My special thanks go to all those who contributed reference material, data and slides for my lecture. Too numerous to be individually listed, they came from the United States, Canada, Europe, Asia, and Australia. Information about the Panaftel (Pan African Telecommunications Network) and about CCIR's activities came from the International Telecommunication Union. Without their generous help, I could not have dealt with the broad subject matter, some of which extended beyond the area of my personal experience.

THE 1981-82 MTT-S NATIONAL LECTURE

Location	Chapters, Other	Date	Attendance
Santa Clara Valley	MTT, AES, CAS	Jan. 14	122
Dallas	MTT, COM	Jan. 20	53
Phoenix	MTT, COM, ED	Jan. 21	60
San Diego	MTT/AP, AES	Feb. 18	15
University, Mississippi	Student Chapter	Feb. 23	23
Canaveral	MTT/AP	Feb. 25	39
San Jose State University	Student Chapter	Mar. 5	31
Baltimore - Washington	MTT	Mar. 15	85
Philadelphia	MTT/AP, EM, R, SMC	Mar. 16	61
N.Y. / Long Island	MTT	Mar. 17	34
Princeton	MTT/ED	Mar. 18	41
Nashville	IEEE Section	Mar. 22	32
North Jersey	MTT/AP	Mar. 23	34
St. Louis	MTT/AP, Student Chapter	Mar. 24	31
Los Angeles	MTT, AP	Apr. 8	18
Milwaukee	MTT/ED	Apr. 19	24
Atlanta	MTT/AP	Apr. 20	32
Boston	MTT, AP, COM	Apr. 21	21
Schenectady	MTT, Student Chapter	Apr. 22	35
Geneva, Switzerland	CCIR/ITU, IEEE Section	May 3	42
Milan, Italy	Italian Electrotech. Society	May 5	45
Rome, Italy	Int. Symp. on Cir. & Systems	May 12	45
Chicago	MTT/AP, COM, ED	May 17	42
Columbus	MTT/AP	May 18	13
Ottawa, Canada	MTT, AP	May 19	52
New Jersey Coast	MTT/ED/QEA	May 20	20
Syracuse	MTT/AP	Jun 10	18
Cedar Rapids	IEEE Section	Jun 11	60

NEW TRANSACTIONS EDITOR



R. H. Knerr



T. Itoh

At the end of the year, Dr. Reinhard H. Knerr will have completed his third year as Editor of the IEEE Transactions on Microwave Theory and Techniques. At its June meeting, the Administrative Committee of the MTT Society approved the appointment of Dr. Tatsuo Itoh as the next Transactions Editor. Because of the time required for the review, editing, and publication cycle, all submissions for potential publication in future issues of the MTT Transactions should be sent to Dr. Itoh instead of Dr. Knerr. The mailing address for our new Transactions Editor is:

Dr. Tatsuo Itoh
The University of Texas at Austin
Department of Electrical Engineering
Austin, TX 78712

Dr. Itoh's telephone number is (512) 471-1072.



DIGICOM

Digital Communications: Microwave Applications by K. Feher (Prentice-Hall, Englewood Cliffs, NJ, 1981, 269 pages, \$30.00) has been reviewed by Dr. Douglas H. Morais of Farinon Canada, Ltd. The book review originally appeared in Communications Magazine, Volume 20, Number 4, July '82.

To my knowledge, Digital Communications: Microwave Applications is the first book written specifically on digital line-of-sight microwave communications. It covers digital theory and techniques that are applicable to line-of-sight microwave systems, as well as other transmission modes such as satellite and cable systems. On the practical side, state-of-the-art implementations of the above techniques in line-of-sight microwave systems are described. This book is intended for use by engineers and managers who are associated with microwave communications systems and hardware, and as a textbook in universities and other technical institutions.

Mr. Feher has written and organized his material well, and, since it is biased towards the practical aspects of digital communications, it should be understood by all interested readers, including those without the mathematical sophis-

tication of research engineers. Excellent references are presented at the end of each chapter for those readers with a bias towards derivation.

The book contains twelve chapters, and the first two are introductory. Chapter 1 covers transmission trends in the telecommunications industry, and the basics of digital microwave communications, pulse code modulation, and existing digital hierarchies. Chapter 2 presents the essential statistical methods required for digital transmission systems analysis.

The book's main subject is covered in Chapters 3 through 11. Chapters 3 and 6 through 10 present detailed and lucid descriptions of digital modulation methods of current interest, along with possible applications of these methods to microwave radio systems. The discourse on the theory and microwave application of correlative techniques (Chapter 7) was written by Dr. Adam Lender, the best known authority in that field. Dr. Lender has contributed a clear, concise treatment of an interesting and useful design concept. In Chapter 4, written by Dr. Wolfgang Hofer, the characteristics and current status of microwave amplifiers are described. This is an important contribution as real digital radio systems are continually faced with performance limitations that result from the use of such amplifiers. In Chapter 5, reliability objectives of typical microwave systems are presented and systems gain requirements necessary to meet these objectives specified. In addition, multipath fading and its effects on digital microwave radio performance is discussed. Specialized measurement techniques required for evaluating digital transmission systems are presented in Chapter 11, and Chapter 12, the concluding chapter, reports on research and development trends in the field.

Digital Communications: Microwave Applications is an excellent, up-to-date book and should be included in any book collection that aims to encompass modern telecommunications technology.



FIBER/LASER NEWS

A new publication from Phillips Publishing, Inc., **Fiber/Laser News**, is a biweekly business management newsletter designed specifically for the executive who needs to stay ahead of the latest developments and marketing applications of optical fiber and laser technology.

Twenty-six issues of Fiber/Laser News is available for \$197 from Phillips Publishing, Inc., Suite 1200 N, 7315 Wisconsin Avenue, Bethesda, MD 20814. Non-U.S. subscribers must add an additional \$17 for postage.

1983 IEEE MICROWAVE AND MILLIMETER-WAVE MONOLITHIC CIRCUITS SYMPOSIUM

BOSTON, MASSACHUSETTS MAY 31 - JUNE 1, 1983

Sponsored by

The IEEE Microwave Theory and Techniques Society

Cooperatively Sponsored by

The IEEE Electron Devices Society

CALL FOR PAPERS

The Second Annual Microwave and Millimeter-Wave Monolithic Circuits Symposium will be held in Boston, Massachusetts at the Sheraton-Boston Hotel on May 31 and June 1. This Symposium is held annually in conjunction with the IEEE MTT-S International Microwave Symposium.

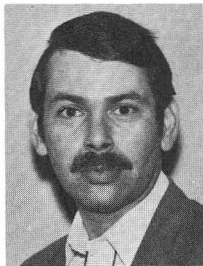
Papers are solicited describing original work in the field of analog and digital monolithic integrated circuits with current or potential applicability to the 1-300 GHz frequency range. The following subject areas concerned with the design, fabrication and testing of microwave and millimeter-wave monolithic integrated circuits are particularly appropriate for this conference:

- **Linear ICs**
- **Digital ICs**
- **Radiation Effects**
- **Systems, Subsystems and Components**
- **Material Growth and Characterization**
- **Power Generation and Amplification**
- **Low-Noise Devices and Amplification**
- **Computer-Aided Design Techniques**
- **Interface and Packaging Problems**
- **Device and Circuit Modeling**
- **Testing and Characterization**
- **Related Device Technology**
- **Quasi-Optical Devices**
- **Reliability**

Authors are requested to submit one-page abstracts clearly explaining their contribution, originality, and importance. Five (5) copies of the abstract must be received on or before 17 December 1982 by:

Dr. James G. Oakes
Westinghouse R and D Center
1310 Beulah Road
Pittsburgh, PA 15235
(412) 256-7665

Notice of acceptance or rejection will be mailed to authors by 15 February 1983. Authors of accepted papers will receive material and instructions for preparing photo-ready copies of papers to be printed in the Symposium Digest, copyright release forms, and presentation guidelines. The authors are also encouraged to prepare expanded versions of the accepted papers for publication in a special section of the MTT-S and/or ED-S Transactions.



EDITOR'S NOTES

by S. L. March

I am going to use this Editor's Note to ruffle a few feathers, antagonize some of our readership, maybe anger some of you enough to write me, and upset others enough to locate my telephone number and tell me off. However, I do not apologize for my comments, opinions, and criticisms.

I believe that the majority of the microwave community is wallowing in a quagmire of apathy. In over eighteen months as Editor of the MTT Society Newsletter, I have received two "attaboys", one complaint about an oversight, one unsolicited editorial, and a few notices of Chapter meetings and one-day symposia from the MTT-S membership. Where are the rest of you? As of May 31st, there were 5914 individuals listed as regular, student, or associate (3) members of MTT-S. This is YOUR Newsletter! Tell me what you like, what you don't like, what changes, additions, or deletions should be made, etc. Don't be part of the silent majority—become a part of the vocal majority.

Two issues ago, I inaugurated a new feature, New Theses. To date I have received publishable data on six new theses. Due to the lack of information submitted to me regarding recent doctoral dissertations in microwave-related technology, I can only assume that one or more of the following must be true:

1. The number of Ph.D.s granted in microwave-related fields is extremely small and is diminishing
2. Academians and doctoral candidates do not care to disseminate information regarding upcoming or recent theses.
3. Very few academians are members of MTT-S and, therefore, are not aware of the new feature
4. Academians can not read (or write)
5. No one cares to support this new column in the MTT-S Newsletter.

If you disagree with my assumptions, let me know. Better still, show me by sending information on new microwave-related dissertations (title, author, university or college, advisor).

I recently concluded an analysis of the authorship of feature articles and shorter papers in the Transactions on Microwave Theory and Techniques for 1966, 1971, 1976, and 1981. I studied the affiliation(s) of the authors, industry, academic, or government, separating each category into USA and non-USA classifications. The four major categories are tabulated below. The numbers represent the percent of each year's total publications.

FULL-LENGTH ARTICLES

	1966	1971	1976	1981
USA Industry	43.7	24.2	22.3	15.6
USA Academic	35.2	34.1	20.2	17.1
non-USA Industry	4.2	12.1	22.3	15.2
non-USA Academic	8.5	19.8	21.3	33.6
Total USA	84.5	65.9	53.2	43.6

SHORT PUBLICATIONS

	1966	1971	1976	1981
USA Industry	43.1	39.8	25.0	10.9
USA Academic	23.6	17.0	17.5	15.2
non-USA Industry	8.3	11.4	15.0	8.7
non-USA Academic	8.3	18.2	28.8	50.0
Total USA	81.9	68.2	51.3	32.6

Do the figures surprise you? W. B. Penn, President of the Electrical Insulation Society, recently played the same type of "numbers game" and published his findings for the 1981 EIS Transactions in that Society's June 1982 Newsletter. What follows is a part of Dr. Penn's column:

"I'm not sure what conclusions to draw or even how valid an analysis based on a particular year's publications can be. Does the fact that with almost 60 percent of the membership, the United States' authors contributed less than 40 percent of the papers (and that figure would have been even lower except for a special conference issue) imply that there is less . . . research and development going on in this country than in others, or is permission to publish more difficult to obtain from one's employers in the United States? Or are people lazier here, more reluctant to write? Japan with some 9 percent of the membership contributed 26 percent of the papers. What kind of questions does this raise in your mind as to levels of activity of both individuals and companies? 'Tis food for thought!"

Dr. Penn reviewed only one year in the Electrical Insulation Society Transactions. What might he have found if he analyzed the transnational character of prior years' EIS Transactions?

Please realize that it is not my intention to curtail or limit publication of articles in the MTT-S Transactions by non-USA authors or to sound nationalistic. The IEEE is an international organization with a membership which is world-wide. It pleases me that the Transactions on Microwave Theory and Techniques provides an eminent forum for the dissemination of advances in microwave technology, regardless of the country of origin.

A recent President's Report by MTT-S President Dick Sparks and the outgoing President's Message by Past MTT-S President Fred Rosenbaum, both of which appeared in the Winter 1982 MTT-S Newsletter, and an April 1982 editorial by Walter Bojsza in MicroWaves magazine revealed that the Microwave Theory and Techniques Society, YOUR Society, is "flush" and is attempting

(continued on page 19)

EDITOR'S NOTES (continued from page 18)

to determine how to best use its surplus funds to benefit its members and the microwave community as a whole. Where are your suggestions? This is your profession. How should we use our excess funds to aid it and all of us active in microwave technology? Make believe that this is election day—voice your opinion to any of us who serve on the Administrative Committee of your Society. Or better yet—complete the postage-paid, pre-addressed reply card and send it to me. The data will be collated and presented to Adcom at its next meeting.



ELECTROMAGNETIC SCATTERING

The following review of **Electromagnetic Scattering and its Applications** by L. P. Bayvel and A. R. Jones (Applied Science Publishers, London and New Jersey, 1981) originally appeared in the June 1982 IEEE Antennas and Propagation Society Newsletter. The 289 page volume was reviewed by Prof. Kenneth Demarest, Lafayette College, Easton, Pennsylvania.

From the title of this book, one might expect its scope to be similar to that of *Electromagnetic Scattering*, edited by P. L. E. Uslenghi. However, a quick glance through the table of contents reveals that the authors' view of the subject is quite different from what we might have expected. Being chemical engineers, their interest in electromagnetic scattering stems from its usefulness in determining the physical properties of material media.

This book consists of six chapters, which are in general well written and laid out in a logical order. It is assumed that the reader is familiar with the fundamentals of electromagnetic theory, but need not be expert in optical inverse scattering techniques or radiative transfer analysis—the major topics considered in this book.

Before giving a chapter by chapter review of this book, two more general observations are in order. First, this work is most concerned with the scattering properties of random collections of simple scatters (such as clouds and aerosols) and not those of arbitrarily shaped bodies. This, of course, makes this book of limited usefulness to those interested in the scattering properties of deterministic geometries. On the other hand, those interested in the scattering properties of statistical scatters and inverse diffraction techniques will find this book useful.

Second, although adequate background material is presented in each section, the major emphasis in this book is to present material covering the advances of the past fifteen to twenty years. This is particularly true in the chapters on optical inverse scattering.

Chapter 1 begins by reviewing some fundamental aspects of scattering such as scattering cross-section, extinction, propagation, and the scattering matrix. This is followed by a thorough discussion of the major canonical solutions that are available in electromagnetic scattering: the sphere, the infinite cylinder, and the ellipsoid. The small particle approximations of these solutions are also discussed. Other topics addressed here include Fraunhofer and anomalous diffraction, geometrical optics, and integral formulations of scattering problems.

Chapter 2 deals with the nature of the radiative transfer of electromagnetic energy through particle clouds. The equation of radiative transfer is developed, taking into account primary scattering, black body re-radiation, and multiple scattering effects. For cases involving multiple scattering, several numerical and approximate techniques for solving the resulting nonlinear differential equation are presented.

Chapter 3 addresses the problem of determining particle size distributions from scattering measurements. A sizable number of techniques are presented, utilizing both Fraunhofer and anomalous diffraction effects. Two types of inversion techniques are discussed: those in which the data is fitted to an assumed distribution function, and those which invert the data directly with no a-priori assumptions. Much of the material in this chapter summarizes recently published work.

Chapter 4 presents experimental procedures and techniques presently used to obtain the scattering data necessary to determine particle size distributions. The techniques are categorized according to the analytical techniques used to interpret the data.

Chapter 5 discusses measurement techniques for determining three other physical characteristics: velocity distribution, refractive index, and degree of anisotropy.

Chapter 6 contains an impressive dossier of studies performed in industry and research where many of the techniques described in this book have been utilized to determine various physical parameters of scattering media. Some of the studies described in this chapter involve steam turbine operation and cooling, particle sizes in a flame, crystal growth rates, and the size distribution in liquid and gaseous aerosols.

In summary, this book is well written and gives thorough review of the analytical and experimental techniques associated with optical scattering by random media. In spite of the fact that much of this work is oriented toward the types of scattering situations encountered by chemical engineers and chemists, the techniques presented here are very much applicable to many RF and microwave scattering problems involving random media.

OPTICAL FIBER MEASUREMENTS

The National Bureau of Standards has issued two new reports on optical fiber measurements.

Measurement of Far-Field and Near-Field Radiation Patterns from Optical Fibers (TN 1032), by Ernest M. Kim and Douglas L. Franzen, describes systems for measuring the far- and near-field radiation patterns from optical fibers. The authors discuss parameters that affect measurement accuracy, precision, resolution, and signal-to-noise ratio. They also describe, with examples, radiation-pattern based measurements of other fiber parameters including radiation angle (numerical aperture), attenuation (using mode filters), index profile, core diameter, and mode volume transfer function.

Backscatter Measurements on Optical Fibers (TN 1034), by B. L. Danielson, describes in detail an optical time domain reflectometer and its components. The author examines the system performance for this device and describes experimental methods for measuring several parameters that characterize optical fibers. These include scattering loss and capture fractions for unperturbed fibers. He also reports experimental capture-fraction values for several step and graded-index fibers. These results are compared with theoretical predictions. Rayleigh backscatter signatures are presented for several fibers from different manufacturers, and fault signatures are shown for some intrinsic and extrinsic fiber perturbations.

The work supporting the data in both reports was performed at the Electromagnetic Technology Division at the NBS Boulder Laboratories.

Copies may be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. TN 1032 is available for \$2.50 prepaid; order by stock no. 003-003-02304-3. TN 1034 is available for \$3.25 prepaid; order by stock no. 003-003-02303-5.



RAYTHEON RESEARCH RELOCATES

As of May 1, the Research Division of Raytheon Company relocated to 131 Spring Street, Lexington, MA 02173. Their new telephone number is (617) 863-5300. Dr. George Jerinic, MTT Society Secretary/Treasurer can be reached at extension 3019 at the new Raytheon location.

1982-83 NATIONAL LECTURE

Dr. Joseph A. Giordmaine is currently preparing for the lecture, Integrated Optics, which he plans to begin in September. Chapters wishing to hear Dr. Giordmaine's lecture should contact him as soon as possible at:

Bell Telephone Laboratories
600 Mountain Avenue
Murray Hill, NJ 07974
(201) 582-2173



EUROPEAN AGREEMENT

IEEE members who visit one of the countries covered by an engineering society belonging to the Convention of National Societies of Electrical Engineers of Western Europe (Eurel) will be treated as guest members of that country's national society, due to an agreement signed June 19 in Copenhagen and subject to confirmation by the Eurel assembly.

Guest members will have, for up to a year, access to facilities, services, and programs of the Eurel society, and members of Eurel societies will be granted the same privileges in the United States. Included are the use of libraries; the right to attend conferences, symposia, and educational activities; and the right to participate in locally organized events such as lectures and excursions, under the same conditions as those granted to members of the host organization. Guest members may also subscribe to publications of the visited society at the standard member subscription rate. For IEEE members to use this guest membership option, Eurel must receive a formal letter from the IEEE indicating that a member is due to take up residence in a Eurel-covered country.

The cooperation agreement also states the organizations' intention to cooperate more closely in the future by arranging joint international conferences, as well as by inviting lecturers of each other's organizations to present papers at national conferences.

The countries whose national electrical engineering societies belong to Eurel are Austria, Belgium, Switzerland, West Germany, Denmark, Spain, France, the United Kingdom and Northern Ireland, Italy, Norway, the Netherlands, Sweden, Finland, and Portugal. The agreement is to be in effect until the end of 1985, after which it may be extended.

1982 JOHN FRITZ MEDAL



David Packard (LF) has been awarded the 1982 John Fritz medal for "distinguished achievement as engineer, entrepreneur, enlightened manager of people, industrialist, and statesman in the application of advanced technology." He is Chairman of the Board of Hewlett-Packard Company, Palo Alto, California, which he

founded with William Hewlett in 1938.

Mr. Packard was elected Chairman of the Board and Chief Executive Officer of Hewlett-Packard Company in 1964. In 1969, he left HP to become U.S. Deputy Secretary of Defense, a post he left in 1971. Upon his return to California, he was re-elected Chairman of the Board of HP.

A previous recipient of the IEEE Founders Medal, Mr. Packard is a member of the National Academy of Engineering. He was President of the Stanford University Board of Trustees from 1958 to 1960.



ENGINEERING DOCTORATES

About 1200, or one half, of the engineering doctorates awarded in 1979 went to non-U.S. citizens, and almost one in three of these doctorate recipients plans to remain in the U.S., according to "Foreign Participation in U.S. Science and Engineering Higher Education and Labor Markets," a report prepared by the National Science Foundation.

The report indicates that the number of non-U.S. students enrolled in graduate science and engineering programs increased 41 percent between 1974 and 1979, while the number of U.S. students in those programs increased by only 9 percent. Of this total of full-time foreign graduate students enrolled in 1979, 41 percent were studying engineering and 30 percent mathematics and computer sciences.

The report attributed the increased enrollment of foreign students in graduate education to the greater demand for U.S.-trained scientists and engineers in other countries and expanded recruitment efforts by U.S. institutions to supplement declining national enrollments.

Copies of the report (number 038-000-00484-1) may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 at a cost of \$4.50.

REPORT OF THE DIRECTOR, DIVISION IV

by *Allan C. Schell*

The regulation of technology transfer among nations is a topic of major importance to IEEE members, affecting both work arrangements and the dissemination of results. The transfer of militarily and economically significant technology can lead to changes in national security and competitive position. The means by which governments attempt to control such transfer include classification of military secrets, restriction of foreign visitor travel, and regulation of exports. The U.S. Government, through executive order, has recently broadened the scope of security classification. There has been a heightened debate over the need for restrictions on the dissemination of unclassified research results, and discussions of the application of the International Traffic in Arms Regulations (ITAR) and the Export Administration Regulations (EAR) as controls on the distribution of information in fields that are considered to impact national interests. Concerns have been raised within the research community that these restrictions will retard the pace and quality of research. The National Academy of Sciences has offered to conduct a thorough review and evaluation of the technology transfer process and the various controls. The IEEE Board of Directors has established an ad hoc Committee on Technology Transfer, composed of representatives from the Educational Activities Board (EAB), the Technical Activities Board (TAB), the United States Activities Board (USAB), and the Publications Board (PUB), as the focal point for IEEE concerns with the various laws and regulations pertaining to technology transfer. The Committee will keep a record of instances where such controls have impeded the flow of technical information.

The United States Activities Board has proposed that the IEEE establish a Political Action Committee (PAC) on a three year pilot project basis, to enable IEEE members in the U.S. to make voluntary contributions to a PAC fund for political candidates. Opposition to the proposal was voiced at the February Technical Activities Board Meeting, and, as a result, the IEEE Executive Committee referred the proposal to The Institute for dissemination to the members, and to the major Boards, Societies, and Sections for comment.

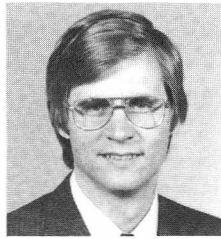
The IEEE Nuclear Testing Laboratory Accreditation Program was authorized last year in response to a request from the Nuclear Regulatory Commission (NRC). Currently the IEEE is preparing to offer accreditation services for laboratories that perform tests on safety-related equipment for nuclear power stations. The NRC plans to publish notice of its proposed rule endorsing the IEEE program and requiring its use after January 1, 1983. The Board of Directors has established an

(continued on page 31)

IEEE PRIZE PAPER AWARD TO MTT MEMBERS



Gary D. Alley



Carl O. Bozler

Gary D. Alley (M) and Carl O. Bozler (SM) have received the W. R. G. Baker Award for their paper, Fabrication and Numerical Simulation of the Permeable Base Transistor, published in the June 1980 IEEE Transactions on Electron Devices.

Dr. Alley is working on the design of gallium arsenide microwave devices at M. I. T. Lincoln Laboratory, Lexington, Massachusetts. He was previously a member of the technical staff at Bell Telephone Laboratories, North Andover, Massachusetts.

Dr. Alley received his B.S., M.S., and Ph.D. degrees in electrical engineering from the University of Kansas, Lawrence, in 1966, 1967, and 1972, respectively.

Dr. Bozler is also with M.I.T.'s Lincoln Laboratory, where he is doing research on epitaxial gallium arsenide, ion implantation, microwave devices, integrated optics, and solar cells. From 1971 to 1974, he was with the Sperry Rand Corporation.

Dr. Bozler received the B.E.E. and M.S. degrees in 1965 and a Ph.D. degree in 1969 from Ohio State University, Columbus.

The Award was presented at Electro on May 23 in Boston, Massachusetts.

Lasers: Theory and Applications has been written as a text for either senior level undergraduates or first level graduate students in engineering or physics. The authors, K. Thyagarajan and A. K. Ghatak of the Indian Institute of Technology, New Delhi, present the basic physics and properties of lasers and some of the laser's most important and interesting applications. The Nobel lectures of Townes, Prochorov, Basov, and Gabor have been included. The 445 page book (ISBN 0-306-40598-9) is available for \$39.50 (\$47.50 outside the USA and Canada).

Optical Fiber Transmission Systems by Stewart D. Personick of TRW Technology Research Center, El Segundo, California offers a systems engineer's view of fiber optics for transmission systems. The emphasis is on systems, subsystems and applications, rather than presenting the details of components. The 192 page volume (ISBN 0-306-40580-6) examines the requirements for digital telecommunication and describes digital data bus and analog transmission systems. The cost for the volume is \$25.00 (\$30.00 outside the USA and Canada).

M. S. Sodha and N. C. Srivastava of the Indian Institute of Technology, New Delhi, have authored **Microwave Propagation in Ferrimagnetics** (ISBN 0-306-40716-7), a 428 page volume on the various aspects of the propagation of microwave—electromagnetic as well as magnetoelastic and magnetostatic—in biased ferrites. The book cost is \$49.50 (\$59.40 outside the USA and Canada).

Orders can be sent to Plenum Publishing Corporation, 233 Spring Street, New York NY 10013 or Plenum Publishing Corporation, Ltd., 88/90 Middlesex Street, London E1 7EZ, England.

MORE NEW BOOKS

Plenum Press has announced four new books of interest to the microwave and millimeter-wave engineering community. The second edition of **Principles of Lasers** by Orazio Svelto, Polytechnic Institute of Milan, Italy and edited and translated by David C. Hanna, Southampton University, England provides broad coverage of the entire laser field, from the first principles and emphasizing the underlying physics without resorting to unnecessary analytical complexity. The book is approximately 375 pages and cost \$29.50 (\$35.40 outside the US and Canada). ISBN 0-306-40862-7.

COMPUTER-AIDED DESIGN

Computer-Aided Design of Microwave Circuits by K. C. Gupta, R. Garg, and R. Chadra (Artech House, Inc., Dedham, MA, 1981, ISBN 0-89006-105-X, 656 pages) is a new book by some of the authors of the previous successful book on *Microstriplines and Slotlines* (Gupta, Garg, and Bahl), also published by Artech House. Like the latter book, this one is well organized, and packed with useful information, which is presented in a very lucid manner. It is the first book to address, exclusively, computer-aided design (CAD) of microwave circuits.

The book covers the three major aspects of CAD, namely, modelling, analysis, and optimization, and is divided into five parts. The first part (two chapters) consists of an introduction to the CAD approach and a review of some basic matrix representations of network properties such as S-, T-, and ABCD-parameters. Of particular useful-

ness is a table of matrix representations of many common passive two-port networks used in microwave circuit design.

The second part (eight chapters) deals with modelling of microwave circuit elements, both passive and active, such as strip- and microstrip-lines, coupled lines, discontinuities in strip- and microstriplines, diodes, and FETs, among others. Much of the material on passive elements is a repeat of the treatment in the authors' earlier book, and could just as well have been omitted without affecting the "spirit" of the book. Some of the formulas on lumped components and microstriplines are somewhat outdated and have been supplanted by more accurate versions. The chapter on measurement techniques, though not directly related to computer-aided design, may be useful to those who wish to have a concise and clear mathematical description of modern network analyzers.

It is when one gets to Part III (analysis) that topics pertaining directly to CAD techniques are addressed. For example, the mathematical basis for deriving the S-matrix of an arbitrary network, from the S-matrices of the individual components is presented. In addition, the mathematical basis for sensitivity and tolerance analysis in CAD are derived and clearly presented. Here, techniques such as pivoting and sparse matrix algebra are explained, though more use of simple examples would have helped, since the matrix algebra used throughout gets somewhat obscure at times. The chapter on time-domain analysis does not seem to be relevant to the rest of the book, and in this reviewer's opinion could have been omitted.

Part IV deals with the all-important topic of optimization. Basic concepts such as direct and gradient search methods, and multi-parameter optimization are discussed. Optimization methods described include, among others, the simplex method, Newton-Raphson method, and Davidson-Fletcher-Powell method. Here again, though the authors' presentation is very clear, more use of simple examples to illustrate the methods would have been helpful.

Finally, the last two chapters (Part V) describe some existing microwave CAD programs including commercially available ones.

This reviewer found the book packed with information on mathematical techniques underlying CAD programs, rather than on CAD, itself. As such, it seems to be aimed at those specialists who are engaged in writing microwave CAD programs and who wish to have a useful, comprehensive reference on mathematical techniques, or to the users of microwave CAD programs who desire to better understand the mathematical basis for these programs.

Despite the book's misnomer and minor shortcomings, it should be a welcome addition to the library of every microwave CAD engineer and programmer.

Reviewed by Dr. Robert A. Pucel, Raytheon Company, Research Division, Lexington, MA.

Reprinted from The Microwave Journal, Vol. 25, April 1982.

IEEE TECHNICAL WRITING COURSE

Technically-Write II, a newly revised correspondence course, is now available from the Institute of Electrical and Electronics Engineers. The course is specifically designed to help scientific and engineering professionals master the communication techniques that are essential for career development.

The course covers the entire spectrum of communication tasks that might confront a modern engineer, including field reports, inspection reports, formal reports, technical correspondence, technical descriptions and instructions, technical presentations, briefings and proposals, and even resumes, and letters of application.

The correspondence course features personal instruction, with each student assigned to an instructor who is a specialist in the field and who will evaluate student progress every step of the way. Completion of this course is projected at 3½ months and students who successfully fulfill all course requirements receive a Certificate of Achievement and 6.0 CEAs.

The course is available to IEEE members at \$127.00, which includes shipping and handling, and to non-members for \$177.00. For additional information, please call the IEEE Education Registrar at (212) 705-7860.



MEDICAL IMAGING

The IEEE has announced the publication of a new journal, the IEEE Transactions on Medical Imaging. The journal is a joint publication of four IEEE Societies: Engineering in Medicine and Biology Society, Nuclear and Plasma Sciences Society, Acoustics Speech and Signal Processing Society, and the Sonics and Ultrasonics Society.

The Transactions will focus on a unified common ground where instrumentation, systems, transducers, computing hardware and software, mathematics and physics are handled together. Authoritative studies will be published on generation, processing and/or display of medical images and on algorithms dealing with image reconstruction and/or restoration for tomography.

A member of any IEEE Society may subscribe to the new Transactions at a cost of \$8.00 per year. The cost for non-IEEE members is \$50.00 per year. To order, write to the IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854, or telephone (201) 981-0060.

BOOK REVIEW

Waveguide Tapers, Transitions and Couplers, Volume 6 of the IEE Series on Electromagnetic Waves, by Frank Sporleder and Hans-Georg Unger, 1979, 302 pp., \$43.50. The book has been reviewed by Dr. Saad S. Saad of Andrew Corporation, Orland Park, IL 60462.

The book title is sufficiently descriptive; it deals with waveguide tapers, transitions and couplers. Publication of a book, exclusively devoted to such a subject, is at least a decade overdue. In itself, this is ample reason why the book should be a welcome addition to the library of any electromagnetic specialist. But the book has many more assets to add to its value. To start with, it is well organized, thoroughly readable, and contains an abundance of useful original material that has not been published before either in English or in a book format.

The topics covered in the book strike a good balance between theory and design of metallic and dielectric waveguide transitions and couplers. Throughout the book one finds extensive analysis using the method of effective sources. When suitable, however, use is also made of the more conventional method of generalized transmission line equations. Design procedures are concerned with the synthesis of transition contours and coupling distributions for prescribed electrical characteristics.

The effective sources method utilizes the equivalence principle to represent a discontinuity along a guiding structure by equivalent electric and magnetic currents. The authors themselves have made considerable contributions to this method and indeed they extract from their own work much of the material for the book. Since application of the method to the subject problems is scarcely covered in previous literature, the book should be enlightening for the reader interested in such applications.

The book has 9 chapters. Chapter 1 is an introduction. Chapters 2-8 deal primarily with metallic waveguide transitions and couplers. Sections 2.8, 2.9, and 8.2 and Chapter 9 are devoted to dielectric waveguide components.

Chapter 2 occupies 27% of the book. It presents the basic concepts of coupled mode theory as applied to a single nonuniform or curved guide, or to two coupled guides. The coupled wave equations are derived for the particular structure either by the powerful and more complex effective sources method or by the conversion of Maxwell's equations into generalized transmission line equations. The latter method, however, is restricted to cases of gradual longitudinal nonuniformities.

Chapter 3 illustrates in detail a different method to analyze tapered waveguides. Here, the field is represented by normal modes of uniform horns in contrast to the waveguide normal mode representation of Chapter 2. In taper analysis this advantageous option is often overlooked.

Chapter 4 covers abrupt waveguide transitions. The authors recognize the fact that neat mathematical solutions do not necessarily mean accurate numerical results, so in a 10-page section they focus on numerical convergence problems encountered when solving coupled wave equations.

In Chapter 5, the classical problem of a TEM multi-section transformer is analyzed and a method for its optimum design is illustrated by detailed examples.

The coupled-mode analysis developed in Chapters 2 and 3 serves in Chapters 6 and 7 as the foundation for design procedures for gradual tapers. Detailed examples are given for designing overmoded tapers. For the tapers which are not gradual enough, the authors present a new technique which is based on quasi-diagonalization of the coupled wave equations. The authors also treat in depth and novelty the coupling of modes below cutoff and the degeneracies of spurious modes, two subjects that are often avoided or confused in the literature. A particularly informative part of the book is contained in a 26-page analysis of the sector-to-circular and sector-to-rectangular waveguide transducers.

Finally, the analysis of Chapter 2 is once again employed in Chapter 8 to develop design procedures for metallic and dielectric waveguide directional couplers, and in Chapter 9 for single and multimode planar optical waveguide tapers.

The shortcomings of the book may now be listed. Firstly, the book offers no preface to tell us about its background, objectives, or which level of reader the authors had in mind while preparing the material. Secondly, the book presumably is not intended to cover all topics that come under its title. Having contributed extensively to the field, the authors tend to focus on their own work and thereby overlook important topics. Examples of missed topics are the "coaxial-to-waveguide transitions" of different types, "numerical modeling of waveguide components," and "transitions and couplers with arbitrarily-shaped cross sections and apertures." Also far from comprehensive are the dielectric waveguide sections of the book.

Another shortcoming is the undersized bibliography. Except for Chapter 1, biographical listings occur only one to ten times per chapter. The numerous references to German publications are just a reminder of how much we miss by reading only English language literature. My last criticism is on the lack of subtitles. If they had been employed, reading the book would have been easier, especially for long sections.

In conclusion, however, the book is a must for engineers and scientists specialized in the field. It is also a good reference book for graduate students.



1982 IEEE FIELD AWARDS

Two of the 1982 IEEE Field Awards approved by the IEEE's Board of Directors have been conferred upon individuals whose accomplishments have been in either microwave technology or contributions germane to the microwave industry.



The Morris E. Leeds Award "for contributions to the field of precise electronic measurement equipment for very high frequencies" has been awarded to **Dr. Lothar Rohde (LF)** and was presented to Dr. Rohde at Eurocon '82 in Copenhagen, Denmark in June.

Dr. Rohde studied at the technical universities of Cologne and Jena and received a Ph.D. degree from the University of Jena in 1981. He was awarded an honorary doctoral degree in engineering by the Technical University of Munich in 1954. Dr. Rohde is owner of the firm Rohde and Schwarz, one of the leading manufacturers of electronic test equipment in Europe. Dr. Rohde holds 21 patents in electronic instrumentation and communication.



The Frederik Philips Award "for technical and managerial roles in the development and manufacture of microwave tubes in Europe" has been awarded to **Dr. Werner J. Kleen (LF)**, retired.

Dr. Kleen received the degrees of Dr. Phil. Nat., in 1931, and Dr. Habil., in 1936, from the University of Heidelberg, Germany. He was made an honorary professor at the Technical University of Munich in 1956.

Dr. Kleen was the Director of the European Space Research and Technology Center, Noordwijk, Netherlands, from 1968 to 1971. From 1956 to 1967, he was the Director of the Siemens Research Laboratory. In addition, Dr. Kleen has taught at the Technical University of Munich and is the author or co-author of several books and numerous publications on classical and microwave electron tubes.



MORE THESESES

Dr. Tatsuo Itoh of the University of Texas at Austin has had two recent Ph.D. students who received their degrees in August, 1982. They are:

Y. C. Shih, "Computer-Aided Design of E-Plane Filters and the Analysis of Transmission Lines on a Semiconductor Substrate"

J. Rivera, "An Analysis of a Microstrip Patch Antenna"

PAC + E = PACE

To avoid confusion with political action committees, known as PACs, the IEEE Professional Activities Committees (also called PACs) have added an E and are now the Professional Activities Committees for Engineers (PACES).

The name was chosen on April 3, at the National Professional Activities Committee Workshop in Washington, D.C. The change was sparked by a proposal by the U. S. Activities Board (USAB) to create an IEEE political action committee, which could have caused confusion within the membership as well as with legislators. The USAB action still must be reviewed and approved by the IEEE Board of Directors.

Editor's Note: I wonder if a gentleman who serves on a political action committee is known as a PAC-MAN?



SPECIAL ISSUE ON GaAs FETs

The IEEE Transactions on Microwave Theory and Techniques will publish a Special Issue on Power and Low-Noise GaAs FET Circuits and Applications in March 1984.

Papers describing original work that includes, but is not limited to, the following areas relating to discrete and monolithic GaAs FET circuit technology and applications are solicited:

- Broadband amplifier design techniques
- Power combining
- Dual-gate FET circuits
- Low-noise FET characterization techniques
- Large-signal load pulling techniques
- Amplifier and oscillator characterization
- Low-noise receivers
- Oscillators
- Novel FET circuits

For further information, contact either of the Guest Editors: Dr. Hua Quen Tserng, Texas Instruments, P.O. Box 225936, Mail Stop 134, Dallas, TX 75265, (214) 995-3597 or Dr. Charles C. Huang, Avantek, Inc., 3175 Bowers Avenue, Santa Clara, CA 95051, (408) 727-0700, extension 2464.

All manuscripts should be sent to Dr. H. Q. Tserng. The deadline for papers is June 10, 1983.

SYMPOSIUM ON ANTENNAS AND PROPAGATION

The Third International Symposium on Antennas and Propagation (ISAP) Japan is planned to be held in Kyoto, Japan, 20-22 August 1985. The Symposium was initiated in 1971 by the Institute of Electronics and Communication Engineers (IECE) of Japan with the aim of providing a regular forum for discussion and exchange of information about antennas and propagation. The first and second ISAP were held in Sendai, Japan in 1971 and 1978.

This meeting, the third ISAP to be held in Japan, will take place in Kyoto and will treat a wider range of subjects. The theme will be 'New Wave Frontiers' and discussions will embrace new insights into various systems in the field of antennas and propagation and related fields. Papers on interrelated topics pertaining to satellite communications, remote sensing, vehicular technology, EMI, and so forth, will contribute to the theme of the Symposium, in addition to papers on theory, design, practice, and applications of antennas and propagation.

The third ISAP is sponsored by the IECE of Japan and supported by the IEEE Antennas and Propagation Society. The Chairman of the Symposium is Professor Fumio Ikegami, Kyoto University.

Persons interested in receiving the forthcoming announcement of the Symposium are invited to write: Professor Kazuaki Takao, Secretary of the Symposium, Department of Electrical Engineering, Kyoto University, Sayo-ku, Kyoto 606, Japan.



THE CHINESE CONNECTION

The October 19, 1981 issue of Wen Hui Bao, the largest newspaper in Shanghai, People's Republic of China, announced the signing of a memorandum between the Shanghai University of Science and Technology and the Polytechnic Institute of New York (formerly Polytechnic Institute of Brooklyn) for collaborative research in wave sciences, i.e., microwaves, optical waves, acoustic waves, seismic waves, etc.

The chief collaborators will be Professor Leo Felson of the Polytechnic Institute of New York and Professor Huang Hung-chia, Director of the Wave Sciences Laboratory of the Shanghai University of Science and Technology and Chairman of the Society of Microwaves, Chinese Institute of Electronics.

COMMENTS ON PAC

by E. J. Doyle, USAB Chairman

As I am sure many of you know from reading The Institute, the United States Activities Board (USAB) has set the IEEE membership to thinking about professional activities by proposing, for the second time in IEEE history, that we form an IEEE Political Action Committee. This Committee would accept contributions from members and contribute these monies to selected congressmen for their campaigns. The last and only time this was proposed to the IEEE Board was in 1977, and the proposal was turned down.

When this proposal was first made, Political Action Committees were new in Washington. No one was very sure where they were going and how they would work. Now, five years later, they are commonplace. There are hundreds of them, and they are not all industry associations or labor unions. The National Society of Professional Engineers (NSPE) has a PAC. As a congressional staffer said to me recently, "You should have a PAC like the AMA." (That sentence needs a New York accent.) So our USAB leaders, who run the Washington activities, decided to have another try.

Many of our members out in the Sections fear that such a move would transform IEEE from a "learned society" to a Washington lobby. My response to this is, if you wish to describe our USAB activity in such a coarse term, we have already taken that step. IEEE has "lobbied" for more portable pensions and played a strong part in the new IRA law. IEEE has lobbied diligently against wage busting under service contracts.

Some members are concerned that after contributing money to congressmen, our testimony on such technical issues as energy, radiation, and health technology will be suspect. Let me assure you that congressmen in Washington are smart enough to know whether you are telling them what you want, or helping them to understand a technical issue.

In reality, having a PAC in Washington has merely become an indication that you intend to be a serious part of the Washington scene. One can do that by hard work and a lot of individual contacts, and indeed the IEEE has done this in the decade it has been in Washington. But today, the existence of a PAC makes entry that much easier.

Some members who have spoken to me question the proposal that administrative expenses, such as mailings and record keeping, are proposed to be paid out of the regular USAB assessment. This is legal under the PAC laws, but no USAB money can be used for direct contributions to congressmen. It should be clearly understood that this proposal to use USAB money for administration is only to get the PAC started. On "day one," there is no other money. But when,

and if, the IEEE PAC becomes successful, it will pay its administration costs out of its contributions.

Our fellow engineering organization, NSPE, has had a PAC since 1978. By 1981, contributions by its members had grown to over \$200,000, with an average contribution of about \$45. The monies were used to contribute to the campaigns of almost 100 congressmen, plus both parties' campaign committees. NSPE also started out by paying administration costs from their normal member dues. But now that they have become successful, they are shifting these costs to the PAC contributors. This is exactly what IEEE proposes to do.

Personally, I am convinced that the formation of an IEEE PAC will not affect our reputation as a "learned society," and that it will improve our ability to operate in Washington in the professional area.



MTT-S LOGO

How many members of the Microwave Theory and Techniques Society realize that the symbol now used by MTT-S as its logo was initially suggested in a contest sponsored by the Society in 1970? The current logo, a pair of Magic Tees suggested by Mr. Robert E. Puttre, was actually the second place finisher in the contest.

At the MTT-S Annual Awards Banquet held during the 1982 IEEE MTT-S International Microwave Symposium, a Certificate of Recognition was presented to Mr. Puttre for his ingenious design.



ROBERT E. PUTTRE

Robert E. Puttre received the B.E.E. degree from Cooper Union, New York, NY in 1958. Following graduation, he joined Wheeler Laboratories, where he served as a Senior Development Engineer supervising antenna and microwave component development. From 1958 to 1961, Mr. Puttre also served as an Adjunct Instructor at Cooper Union.

In 1967, he joined TRG/Control Data Corporation, Space and Defense Division as a Staff Specialist responsible for the development of airborne antenna systems. In 1970, Mr. Puttre joined the New York Telephone Company where he presently has a staff position in the Microwave Radio Group.

Mr. Puttre is a Senior member of the IEEE and a past Chairman of the New York Chapter of the Communications Society. He is a member of Tau Beta Pi and a licensed Professional Engineer in the State of New York.

CHAPTERS MEET

The **Chicago Chapter** of the Microwave Theory and Techniques Society has reported on its March through June 1982 Chapter meetings. On March 8th, Ivar Pakulis of Advanced Moisture Technology, Inc., Wauconda, Illinois spoke on "Moisture Measurement Using Microwave Techniques." The April 17 meeting was a Saturday tour of Cablevision of Chicago. Dr. Ferdo Ivanek, Harris Corporation, Farinon Operation, San Carlos, California, the MTT-S National Lecturer, spoke on "Microwave Communication Technology" at the Chicago Chapter's May 17th meeting. Mr. Burton A. Newman, Manager of Advanced Microwave Technology, Defense Systems Division, Northrop Corporation, addressed the June 28th meeting on the subject of "Microwave Integrated Circuits for Electronic Warfare."

On March 18th, Kenneth L. Carr of M/A-Com, Inc. spoke to the **Dallas Chapter** of MTT-S on "Microwave Applications to the Detection and Treatment of Cancer." Dr. James R. Griffin of Texas Instruments spoke on "TI Broadband RF Receiver Technology" to the May 20th meeting of the Dallas Chapter of our Society.



EVEN MORE NEW BOOKS

Antenna Theory: Analysis and Design by Constantine A. Balanis has been published by Harper and Row, Suite 5D, 10 East 53rd Street, New York, NY 10022. The price of the volume is \$39.50 (including an additional \$1.50 for postage and handling).

Raymond S. Pengelly is the author of **Microwave Field-Effect Transistors: Theory, Design and Applications**, published by John Wiley and Sons, Inc., 605 Third Avenue, New York, NY 10158 or John Wiley and Sons, Ltd., Baffins Lane, Chichester, Sussex PO191UD, United Kingdom. The 488 page volume sells for \$34.95.

Advanced Solid State Technology for Radar is a reprint volume edited by John Clarke of the Royal Signals and Radar Establishment, England. This book assembles 94 papers which previously appeared in one of the Military Microwave Conference Proceedings or one of the European Microwave Conference Proceedings. The 584 page book was published in June 1982. The cost is £22 sterling including packaging and postage via surface mail. Order from Publications Sales Department, Microwave Exhibitions and Publishers, Ltd., Convex House, 43 Dudley Road, Turnbridge Wells, Kent, TN1 1LE, England, United Kingdom.

GaAs vs. Si FOR DIGITAL LOGIC

I. Introduction

A key issue in the apportionment of military and commercial R&D dollars in the 80's for digital logic technology is to acquire a clearer perspective of the future roles of silicon and gallium arsenide. On September 17, 1981 in Washington, D.C., the IEEE Department of Defense Subcommittee of the USAB (United States Activities Board of IEEE) Research and Development Committee convened a one-day meeting of industrial specialists (IEEE Adhoc Committee on Si/GaAs for Digital Applications) to discuss this issue. The members of this specialist group are listed in Appendix I. Members were chosen because of their intimate familiarity with both the materials in question and in a manner to reflect broad industrial representation. All members had experience in public scientific debate on the advantages and disadvantages of these materials for digital and microwave applications. The purpose of this meeting was to reach a consensus on the relevant material properties, range of system applicability, and cautions surrounding each material for digital logic. The following represents the ad hoc committee's effort at achieving a collective perspective on an admittedly complex issue.

II. Material Advantages of GaAs and Silicon

The fundamental attraction of GaAs for high speed devices is found in the velocity vs. electric field characteristic for electrons. The slope of the characteristics at low field, i.e., the electron drift mobility, is approximately six times higher for GaAs than it is for Si. Although the saturation velocities are almost equal, electrons in GaAs exhibit a peak velocity which is considerably higher than that in silicon, which further shortens device transit times. For very short dimensions ($<0.5 \mu\text{m}$) nonequilibrium effects may further increase device speeds, particularly at low temperature. The availability of semi-insulating GaAs substrates simplifies circuit fabrication by providing a natural means of device isolation. Line-to-ground capacitance is low in GaAs because the effective ground plane can be at the back of the substrate. This advantage in sparse circuitry diminishes as chip complexities increase, and line-to-line capacitance becomes dominant. The short lifetimes of excited carriers in GaAs give this material superiority over Si in terms of radiation hardness. MESFET devices exhibit an additional advantage in terms of rad hardness because they do not have a sensitive gate oxide. At the beginning of 1982, the best rad-hard values for silicon NMOS and bipolar are 10^5 rads and 1 to 5×10^6 rads, respectively. Best values for silicon MESFETs and gallium arsenide MESFETs are 5×10^6 rads and 0.5 to 1×10^8 rads, respectively.

Silicon being an elemental semiconductor does not exhibit the complex defect structure associated with compound semiconductors, such as GaAs. Because silicon has less defects, it has a much longer minority carrier lifetime than GaAs; its chemistry and physics are more tractable and

better understood. The sheer volume of the semiconductor industry has made available a plentiful supply of high quality, low price, well characterized substrates. Thermally-grown SiO_2 not only provides a very effective hermetic passivation, but also provides a sophisticated low surface state interface for device fabrication. While the excessively large ratio between electron and hole mobility (~ 10), virtually rules out complementary logic application for GaAs, the corresponding ratio for Si (~ 2) makes the speed penalty of complementary logic (CMOS) affordable in exchange for the advantages of very low power dissipation.

III. Application Ranges for GaAs and Silicon

A realistic prediction of future applications for GaAs ICs must place this technology in the role of being complementary to silicon IC technology. GaAs provides an extension to the capabilities of silicon; GaAs is not a head-on competitor. Silicon will remain the preferred material if it can meet the critical requirements of an application; this is due to overwhelming advantages in production cost, experience, and availability for this material. Hence, silicon will continue to maintain its strongly dominant role in digital logic for both commercial and normal military environments.

On the other hand, the unique capabilities of GaAs digital devices which ultimately determine its application range are threefold: (1) its higher peak frequency, (2) its higher environmental compatibility (temperature, radiation), and (3) its ability to combine high frequency analog (or sampled analog) and digital logic functions monolithically.

Thus, GaAs will have a dominant role for high speed MSI and LSI digital preprocessing circuits in the front end of many microwave systems. Examples of such customized high leverage preprocessor circuit functions are multiplexers and demultiplexers, microwave frequency counters and fast pulse sorters, digital phase lock loops and frequency synthesizers, gigabit rate code generators and digital delay lines. Such important high performance ICs will find near term application not only in military spread spectrum communication, radar and electronic warfare systems, but also in commercial communication satellite systems and other microwave communication and instrumentation hardware.

The environmental tolerance characteristics of GaAs means that GaAs ICs will be developed to complement currently used silicon bipolar ICs for high radiation military systems such as nuclear missiles and military spacecraft. Here, GaAs can offer a combination of high speed, moderate-to-low dissipation and radiation hardness. Furthermore, GaAs's higher temperature operation provides potential unique applications such as in aircraft engine control systems and nuclear test instrumentation. At low temperature (77°K), high speed GaAs digital logic is currently under serious investigation by the computer industry.

Lastly, in the area of monolithically combined high frequency digital logic and analog circuit ICs, GaAs will have a role for such critical functions as wideband A/D and D/A converters and

related digitizing and sampling circuits. Other analog-digital logic IC combinations are possible employing wideband charge coupled devices and/or the unique optoelectronic device characteristics of GaAs.

Currently, GaAs high speed digital logic at frequencies of 1-3 GHz is being gradually applied in custom MSI form for microwave related systems. As the capability and maturity of GaAs evolves, an LSI integration level and higher digital clock rate performance will be utilized. Using sub-micron dimensions, it is estimated that GaAs FET IC counters will achieve speeds of 10-12 GHz within the next five years. Even though silicon IC peak frequency capability is also subject to improvement with new technology, GaAs intrinsic device speed should maintain its current advantage of approximately between two-to-one and three-to-one in devices utilizing the same lithographic dimensions. As discussed, this advantage will be best utilized for the serial microwave signal-related circuit functions identified above, and not for interconnect-intensive, parallel structure VLSI more suitable for silicon.

IV. Some Cautions in Evaluating GaAs and Si

It should be remembered that although the discussion thus far has concerned itself with the intrinsic speed of the devices, in actual circuits and systems, the chip, package, and board parasitics can combine to degrade intrinsic device speed by as much as two orders of magnitude independent of technology. This problem becomes worse as lithography rules are reduced. This packaging and board layout activity has been neglected in comparison to research on the drivers. Significant R&D advances can be made in this area using innovative interconnect configurations.

The reduction of lithography rules significantly below one micron may change the current assessment of silicon and gallium arsenide based on one micron rules in VLSI configurations. At shorter dimensions, nonequilibrium effects may become important in gallium arsenide before they do in silicon. On the other hand, at the resulting higher fields, the saturation velocity of silicon becomes essentially equivalent to that of gallium arsenide. Obviously, ultimate trade-offs have yet to be determined for the two materials in short dimension devices.

Finally, one must expect the unexpected. New device structures are always being invented and new materials, mostly other III-IV compounds, are being investigated. Examples such as the permeable base transistor, the heterojunction bipolar transistor, and the modulation-doped transistor may well change the technology of choice for ultra-high-speed digital logic as they mature.

V. Acknowledgment

The Committee would like to thank Bill Herrold of the IEEE USAB Office and Dineene O'Connor and Nate Butler of the Palisades Institute for helping make the detailed arrangements for this very interesting and stimulating one-day meeting.

Appendix I

Membership of IEEE Adhoc Committee on Si/GaAs for Digital Applications

- H. C. Nathanson Westinghouse
- P. Chatterjee Texas Instruments
- B. Dunbridge TRW
- G. Smith Bell Labs
- P. Solomon IBM
- J. G. Oakes Westinghouse
- R. Van Tuyl Hewlett-Packard
- M. Waldner Hughes
- R. Zucca Rockwell



ARFTG FALL MEETING

The twentieth conference of the Automatic RF Techniques Group will be held November 4 and 5, 1982 at the Hilton Harvest House Hotel, Boulder, Colorado. The conference's main topic will be **Six Port Measurement Systems**. Papers are also solicited on recent hardware and software developments in computer-aided RF design and testing. Technical exchange will be accomplished by informal twenty minute talks. Authors are requested to submit a 500 to 1000 word summary with illustrations explaining the contribution and its usefulness to the conference attendees. Two copies of the summary should be sent on or before 3 September 1982 to: H. George Ottman, Hughes Aircraft Company, Building 268, Mail Stop A-55, Canoga Park, CA 91304, (213) 702-2293.

ARFTG is planning a special banquet on the evening of November 4 to commemorate its tenth anniversary. Other special events are a Six Port Panel Discussion to be moderated by Glenn Engen in the afternoon on November 4, and a tour of the National Bureau of Standards Laboratories on the afternoon of November 5.

A portion of the November 5 session will be reserved for manufacturers to demonstrate new equipment that has been specifically designed for use in computer-aided RF design and test. Interested manufacturers are urged to contact, on or before September 5, Ed J. Stevens, RCA Government Systems Division, Borton Landing Road, Building 101-124, Moorestown, NJ 08057, (609) 755-3905.

For any other meeting details, contact the ARFTG conference chairman: Mario A. Maury, Jr., Maury Microwave Corp., 8610 Helms Avenue, Cucamonga, CA 91730, (714) 987-4715, extension 21.

MTT-S BY-LAW CHANGE

At the June 1982 meeting of the Administrative Committee of the Microwave Theory and Techniques Society, a by-law change was approved by the Adcom. The by-law, Article I (Nominations, Elections and Appointments), Section B (Elections), Paragraph 1 concerns the election to membership in the Administrative Committee. The change must still be approved by the Technical Activities Board of the IEEE. The affected paragraph, with the changes given in **bold type**, follows:

1. MEMBERSHIP

The Administrative Committee shall hold an annual meeting each year during the **Fall**. At the annual meeting, the Administrative Committee shall hold elections to fill vacancies in the Administrative Committee to occur on the succeeding **JANUARY 1**. **All elected members and the three (3) immediate past Presidents of the Administrative Committee** not presently eligible for re-election shall elect, provided that these holdover members present constitute a quorum. The Administrative Committee may make contingent elections to be effective in case an elected member fails to accept the office, or a disapproval is received from Headquarters. The names of the elected members shall be transmitted to the Chairman of the Technical Activities Board. Unless disapproval of such elected members is received within 60 days of each transmittal, the elections shall become final.

Each eligible **voter** shall submit a ballot listing their choice of filling the six elective positions. The votes shall be counted by a teller's committee appointed by the President of the Administrative Committee, no member of which is either eligible to vote or a candidate for election. All votes shall carry equal weight. Any candidate receiving a plurality **and majority** on the first ballot is elected. Additional ballots shall be held, listing as candidates the remaining nominees. **In the event that the first ballot does not fill all six (6) vacancies, the eligible voters may choose to remove from the next ballots, candidates having the fewest number of votes on the previous ballot. On the second ballot, a plurality of votes shall elect and the presiding officer shall not vote except to break a tie.**



APPLIED OPTICS

Applied Optics: A Guide to Optical System Design, Volume 2 by Leo Levy has been published by John Wiley and Sons, Inc., New York, NY. The 1128 page volume was published in 1980 and currently retails for \$75.

The book has been reviewed by John G. Ackenhusen of Bell Telephone Laboratories. The

review originally appeared in the July 1982 issue of Spectrum, Volume 19.

For the practicing optical designer who changes specialty from one field of optics to another, this book is an excellent vehicle for quickly learning new key ideas, terminology, and references. It lacks, however, detailed information about particular areas necessary to the specialist.

In the belated second volume of *Applied Optics*, published in 1968, the author might be expected to have widened his coverage, since he dispensed with the obligatory topics, such as Maxwell's equations and lens-design formulas, in the first volume. He succeeds in this, however, only part of the time. For example, the reader will find a chapter on the anatomy, transfer characteristics, and temporal properties of the human eye, as well as one on atmospheric optics that is one of the most comprehensive to be found in a general optics book.

But the volume does not elaborate on principles developed in the first. Instead, it is a continuation, with chapter and table numbering resuming where they left off earlier.

The first section has a chapter on optical materials and covers many commercial media. The second, on light detectors, has chapters on vision, photoelectric and thermal detectors, and photographic media. In the third, "Systems," is a chapter on evaluating optical systems and another on coherent optical systems, and the last section has 124 tables related to the text.

The depth and structure of subject development vary widely. The discussion of coherent imaging, for example, is almost as mathematically detailed as specialty textbooks. Other sections are more descriptive. Throughout, the reader can usually obtain operational equations describing the dependence of an optical parameter upon system variables, but cannot always be sure to find an explanation of the relevant physics.

Although *Applied Optics* is intended, as the preface says, to "permit self-study by the graduate engineer and to serve as a handbook to the experienced practitioner," it is not a textbook. The necessary pedagogical features, such as evolutionary, chapter-by-chapter development and exercises, are absent. This is primarily a handbook for practitioners. The table of contents has four levels of subsections, which is useful, though this heavy degree of subdividing makes the book choppy in places (at least one subsection consists of a single sentence which refers to a table).

The two volumes of *Applied Optics* are inseparable, with references in Volume 2 to tables in Volume 1. Some of the tables are described only within the text, so the reader must flip awkwardly between table and text.

Despite these limitations, the book is a good overview of optical design, with frequent and excellent references. The reference list has been updated from the earlier one. The layout, printing, and figures are excellent.

DIRECTOR'S REPORT (continued from page 21)

ad hoc oversight committee to provide periodic reviews and reports of the accreditation program.

Two of the IEEE Boards have been reorganized. The Standards Board has been moved from the jurisdiction of TAB to the Board of Directors, and the Educational Activities Board has substantially broadened its membership to include representatives of the other IEEE Boards and educational activities, as well as academic associations.

The rapid increase of activity in two technical areas has prompted requests for the formation of new IEEE entities. At the February meeting, TAB approved in principle the formation of a Council on Fiber Optics. Representatives of the Communications, Electron Devices, Microwave Theory and Techniques, and Quantum Electronics and Applications Societies, as well as the Optical Society of America will meet to plan the publication of a journal devoted to this growing field. Also, a Committee on Robotics is being formed to determine an appropriate course for IEEE activity in this area, which is of fundamental interest to the Components, Hybrids, and Manufacturing Technology Society.

A TAB Centennial Conference is being planned by an ad hoc group headed by Barry Oakes. The event has as its objective to inform the public about high technology topics of major interest via widely respected invited speakers. The meeting dates have been set for the third week of February 1984 and the site is Washington, D.C. This conference is one that needs the support of the Societies, and Division IV has the expertise to contribute significantly to the success of the meeting. More about this later.

The President of the IEEE, Robert Larsen, signed an agreement with the European national electrical engineering societies for cooperation in organizing and planning conferences in Europe, and for allowing visiting members the privileges of guest membership. Close relations between IEEE and national engineering societies throughout the world are important to those who are interested in holding international meetings, especially if they are sited in countries where the national society has an active schedule of conferences in allied areas. Planners of IEEE conferences should be sensitive to these issues and should work with the IEEE Technical Activities Department to promote cooperation whenever possible.

On June 8, a panel of IEEE Technical Editors met in New York City to discuss issues concerning the editing and publication of the various IEEE journals and transactions. The guest speaker was Ellis Rubinstein, who described the recent round table of government and industry leaders on the topic of restrictions to technology transfer. After lunch, the editors reviewed aspects of operations of the IEEE Publications Department.

Two other IEEE publications are on the horizon—the Communications Society is starting in 1983 the IEEE Journal on Selected Areas in Communications, and a committee has been formed to develop a journal in the area of robotics.

In the latest installment on where your money goes, the TAB Finance Committee has examined the costs for accounting and financial record-keeping, and determined that the portion attributable to Groups, Societies and Councils is \$371K (about 40% of the total). The recommendation of the Finance Committee is that this amount be paid by the TAB entities in 1983. Because these charges are to be related to the actual costs incurred by the Societies, as I urged last year, instead of treated as a tax on those who can best pay, the amounts due by Division IV Groups and Societies will be proportionately less than the increase of the total compared to last year.

The primary activity of the IEEE is the transfer of technical information within the electrical/electronic engineering community. With the rapid increase in technology throughout the world, the community of participants has become global; about 30% of Group and Society memberships are from countries other than the U.S., as are many of the contributions to the Transactions. In a recent personal trip to New Delhi I had the opportunity to meet with Dr. R. K. Arora, chairman of the ED/MTT Chapter there, as well as several other present and past officers, thanks to the kind help of Dr. Prasad Kodali. Interactions within our Societies, whether it be the delivery of transactions, participation in meetings, visits by Society lecturers, or other activities, are very real issues to them. I would urge all Societies to keep the larger scope of their memberships in mind as they plan their programs. Spectrum and The Institute are now airmailed to all Section Newsletter Editors in Regions 8, 9 and 10 in order that local members can obtain calls for papers and other time-critical information without excessive delays. The Publications Board is exploring improved methods of mailing Institute publications to overseas locations, and the prospects for substantially decreasing some delivery times are good.

On this year's ballot there is a proposed constitutional amendment to restrict all IEEE activities to the U.S. This proposal would attempt to sever the connections of the world-wide technical community that has been built over the years. The vision of this proposal ends at the U.S. borders, and fails to perceive that the U.S. no longer has all the answers to technological questions and that the community of technical specialists transcends national boundaries. Excellence is not a matter of geography and, if the IEEE is to stay in the mainstream of the future of electrotechnology, it must encourage the participation of engineers through membership in a transnational organization.

If I may be permitted a little electioneering in this column, I would remind you that I am a candidate this year for Executive Vice President of the Institute. The position is one with a constituency of the entire IEEE, and over the years I have participated in the activities of most of the entities of the Institute. I believe that I can bring a sensitivity to the concerns of the Groups, Societies and Councils to the deliberations of the Executive Committee. If elected, that is what I shall do.

BOOK REVIEW

Solid-State Microwave Amplifier Design by Dr. Tri T. Ha is a 326 page book published by John Wiley and Sons, One Wiley Drive, Somerset, NJ 08873 (ISBN 0-471-08971-0), \$37.50. The book was reviewed by Dr. James W. Gewartowski, Bell Telephone Laboratories, Allentown, Pennsylvania.

This text covers the basic design of solid-state microwave amplifiers, with heavy emphasis on GaAs FET amplifiers. It is most suitable for use in a graduate level course, since it assumes a basic knowledge of matrix theory and network synthesis. Practicing microwave engineers will also find it useful to broaden their knowledge of the field.

Although the book emphasizes GaAs FET amplifiers, there is some discussion of bipolar transistor and negative resistance amplifiers (Impatt and Gunn). The author appears to have included this material only for completeness. Since Dr. Ha is working in the field of satellite communications, he has emphasized designing for communications applications, including considerable material on distortion analysis.

The major thrust of the book is on circuit analysis and synthesis. There is a sketchy discussion of the physics of the active devices, but the emphasis is on the use of their equivalent circuits. The parameters of the equivalent circuits are derived from external RF measurements of the devices. Thus, for example, noise performance is given in terms of the optimum noise input reflection coefficient and the input noise resistance as measured for a transistor.

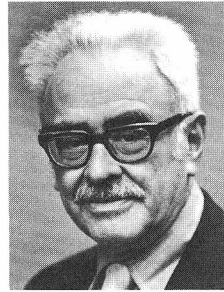
The book is organized into six chapters. The first two chapters present the formalism of the matrix characterization of networks, including the scattering matrix and the Kurokawa power wave concepts. The requirements for unconditional stability are derived. The treatment is adequate, but not as general or complete as that given in K. Kurokawa's book, *An Introduction to the Theory of Microwave Components*.

The third chapter presents some useful material on components for microwave integrated circuits. Formulas for microstrip lines are presented, including a seven-page appendix with tables for the dimensions of practical lines. Useful formulas for lumped inductors and capacitors are also given. The chapter also contains bias-circuit configurations for both GaAs FETs and bipolar transistors.

Amplifier circuit design is covered in Chapters 4 and 5. Chapter 4 covers narrowband design for either low-noise or power applications, including considerations of stability. Chapter 5 is an eighty-three page discussion of broadband amplifier design. Using a simplified unilateral equivalent circuit for the transistor, an exact synthesis approach is presented for Chebyshev and Butterworth designs with and without gain-slope equalization. Numerous examples are given to clarify the technique. The approach uses lumped elements for realization and the technique for re-

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1982 IEEE LAMME MEDAL



Dr. Marvin Chodorow (LF) has been awarded the 1982 IEEE Lamme Medal "for contributions to the theory and design of high power klystrons and traveling-wave tubes." He is professor emeritus of applied electrical engineering at Stanford University, California.

Dr. Chodorow received a bachelor's physics from the University of Buffalo, in 1934 and a Ph.D. degree from Massachusetts Institute of Technology in 1939.

Dr. Chodorow joined the Physics Department at Stanford University in 1947. In 1959, Director of Stanford's Microwave Laboratory (the Edward L. Ginzton Laboratory) and was appointed Barbara Kimball Brown Professor of Applied Physics—the first holder of the chair in the humanities and sciences at Stanford University.

Dr. Chodorow's work on high-power led to the design of the first multi-megawatt klystron. Dr. Chodorow was a Fulbright Fellow at Cambridge University from 1962 to 1964. He was elected to the National Academy of Sciences in 1967 and to the National Academy of Engineering in 1971. He is the co-author of a book on wave electronics, has written 41 articles, and holds 15 patents.



CALL FOR PAPERS

1983 IEEE International Solid-State Circuits Conference

When: Feb. 23-25, 1983

Where: New York, New York

Deadline: September 24, 1982

Submission: 30 copies of 35 word abstract and 300-500 word summary

Submit to: Lewis Winner, 301 Almeria Avenue, Coral Gables, FL 33134, (305) 446-8193

OFC '83, Topical Meeting on Optical Fiber Communication

When: February 28 - March 2, 1983

Where: New Orleans, Louisiana

Deadline for Submission: September 24, 1982

Submission: Original plus copy of 35 word abstract plus 200-500 word summary (including photographs and figures)

Submit to: OFC '83, Optical Society of America, 1816 Jefferson Place, N.W., Washington, D.C. 20036, (202) 223-8130

Mediterranean Electrotechnical Conference 1983 (MELECON '83)

When: May 24-26, 1983
 Where: Athens, Greece
 Deadline for Submission: September 30, 1982
 Submission: 3 copies of 200 word summary (in English)
 Submit to: Prof. E. N. Protonotarios, National Technical University, 42, October 28th Street, Athens (147), Greece

Sixth International Conference on Digital Satellite Communications

When: September 19-23, 1983
 Where: Phoenix, Arizona
 Deadline for Submission: September 30, 1982
 Submission: 4 copies of 1000 word summary
 Submit to: Howard B. Briley, Communications Satellite Corp., 950 L' Enfant Plaza, S.W., Washington, D.C. 20024, (202) 863-6248

National Radio Science Meeting

When: January 5-7, 1983
 Where: Boulder, Colorado
 Deadline for Submission: October 1, 1982
 Submission: Abstract
 Submit to: Prof. S. W. Maley, University of Colorado, Department of Electrical Engineering, Boulder, CO 80309

1983 International Society for Optical Engineering (SPIE) Technical Conference

When: April 18-22, 1983
 Where: Geneva, Switzerland
 Deadline: October 1, 1982
 Submission: Four copies each of 200 to 300 word double-spaced abstract and biographical sketch
 Submit to: SPIE 1983 Conference, P.O. Box 10, Bellingham, WA 98227, (206) 676-3290

1983 IEEE International Symposium on Circuits and Systems

When: May 2-4, 1983
 Where: Newporter Inn, Newport Beach, CA
 Deadline: October 1, 1982
 Submission: 4 copies of 500 word summary
 Submit to: Dr. Sangit K. Mitra, Department of Electrical and Computer Engineering University of California, Santa Barbara, CA 93106, (805) 961-3957

1983 International Conference on Communications (ICC '83)

When: June 19-23, 1983
 Where: Boston, Massachusetts
 Deadline: October 18, 1982
 Submission: Four copies each of one page abstract plus 300 word maximum manuscript
 Submit to: Dr. L. J. Ricardi, MIT Lincoln Laboratory, P.O. Box 73, Room D-422 Lexington, MA 02173, (617) 862-5500, extension 7331

NAECON '83, National Aerospace and Electronics Conference

When: May 17-19, 1983
 Where: Dayton, Ohio
 Deadline: November 1, 1982
 Submission: 300 word abstract plus biographical sketch
 Submit to: Dan Snyder, 2046 Northern Drive, Dayton, OH 45431, (513) 255-4709

Forum '83, the 4th World Telecommunication Forum

When: October 29 - November 1, 1983
 Where: Geneva, Switzerland
 Deadline for Submission: November 1, 1982
 Submission: 4 copies of 1000 word summary
 Submit to: Forum '83 Secretariat, International Telecommunication Union, Place des Nation, CH-1211, Geneva 20, Switzerland

CLEO '83, Conference on Lasers and Electro-Optics

When: May 17-20, 1983
 Where: Baltimore Convention Center, Baltimore, Maryland
 Deadline: December 6, 1982
 Submission: Original, plus copy of 35 word abstract plus same for 200-500 word summary, typed double spaced
 Submit to: CLEO '83, Optical Society of America, 1816 Jefferson Place, N.W., Washington, D.C. 20036, (202) 223-8130



INDIA MTT CHAPTER

1981 was a very busy year for the joint MTT-S/ED-S Chapter of the IEEE India Council. The Chapter arranged technical meetings on 21 separate dates. Some of these technical meetings were arranged in connection with the joint AES/COM Chapter of the IEEE India Council, the IEEE Delhi Section, and the Institution of Electronics and Telecommunication Engineers India. Meetings were held in Delhi, Bombay, Hyderabad, Bangalore, and Sahibabad. In addition, the Chapter, in conjunction with the AES/COM Chapter, organized a symposium on magnetic materials, devices, and their applications in microwave equipment which was held September 11-12, 1981 in New Delhi.

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BOOK REVIEW (continued from page 32)

placing them with sections of transmission line is included. Some numerical methods for computer optimization of the network parameters are presented. Finally, a general matching approach is presented, which does not require the unilateral model of the transistor.

The final chapter begins with a 46-page treatment of distortion analysis in amplifiers. Both the power series approach (memoryless systems) and the Volterra functional series approach (systems with memory) are covered nicely. The topics of cross-modulation, intermodulation, group delay and AM-to-PM conversion are all covered adequately. This material was most welcome in a book whose primary emphasis is on microwave technology. The chapter ends with a discussion of power combining techniques.

Equations useful for computer analysis are derived throughout the book. Relatively few general results are presented in graphical form.

The text has one major weakness; the referencing system is poor. Although each chapter has appended a good set of references, they are not adequately referenced in the text. Thus, the reader often finds himself in the position of wanting more information but not knowing where to go. If used in a course, the instructor would have to fill in some of these gaps.

I noted one conceptual error. The non-linear behavior of the GaAs FET is stated to be primarily due to the transconductance and the gate-source capacitance nonlinearities. Instead, it has been demonstrated that the output conductance non-linearity is very significant and that the gate-source capacitance nonlinearity can be neglected.

Dr. Ha is to be commended for an excellent work. I heartily recommend the book to anyone interested in microwave amplifiers.

This review is reprinted from the IEEE Communications Magazine, Volume 20, Number 2, March 1982.



MSAT '83

by S. L. March

The following is an editorial comment reflecting the opinion of the author only. It should NOT be construed to reflect the opinion of the IEEE, the Microwave Theory and Technique Society, the Administrative Committee of the Society, or any of its members.

"Hardware, not physics." An editorial by the management of EW Communications, publishers of Microwave Systems News purported to discuss the reasons for inaugurating a new microwave conference. In the April 1982 MSN, they state "Industry leaders have remarked to EW Communications management that current trade shows, while admirably covering theoretical ad-

vances in the microwave discipline, do not adequately cover the practical applications ultimately resulting from the research. To fill this need, EW Communications is inaugurating a show that stresses the practical side of microwave technology." EW Communications is calling the conference Microwave Systems Applications Technology '83 (MSAT '83), which will be held March 8-10, 1983 in the Sheraton Washington Hotel, Washington, D.C. EW Communications claims "The working engineer, who needs to bridge the gap between technology and applications, then, is the person whom the conference is being designed for."

The annual MTT-S International Microwave Symposium is not strictly a research-oriented conference as the management of EW Communications contends. Having served as co-chairman of the Technical Program Committee for the 1982 edition of the MTT-S International Microwave Symposium, I feel that I am in an excellent position to judge and comment on EW Communications' position. While it is true that papers on field theory, network theory, and others scattered throughout the technical presentations were strictly theoretical, the vast majority of papers were hardware, applications, or device oriented.

MSN contends "MSAT '83 is an international conference and exhibition dedicated to system design, test, and integration of advanced microwave hardware." Sessions on microwave systems and testing of microwave hardware have been included in all recent MTT-S Symposia. In addition, the Automatic RF Techniques Group, ARFTG, has been holding a day and one-half workshop on microwave test techniques in conjunction with the MTT Symposium for the past five years.

If MSAT '83 is designed to fill a "gap," why not encourage more submissions to the MTT-S Symposium for consideration? I am certain that this action would translate into an increased number of presentations in the areas of system design, test, and integration. Surely, the MSAT '83 advisory board or session chairman could solicit the same presentations for the 1983 MTT-S International Microwave Symposium, which will be held in Boston, June 1-3.

Looking at the names and titles of the seventeen individuals who comprise the MSAT '83 advisory board, I am astonished. There is not one "hands-on," working, design engineer listed, and only one individual from the academic community. Do these corporate presidents (5), vice-presidents (4), U.S. Congressmen (2), and the likes really understand the needs of the microwave engineer?

In a recent advertisement, EW Communications states, "We expect to fill out session attendance reservations shortly. To ensure your place at this . . . experience, we urge you to make your reservations now." The annual MTT-S Symposium does not limit reservations; there is virtually no limit to the number of allowable attendees.

As for the technical program, MSAT '83 expects to have more than 60 speakers in 13 sessions, one of which is a special evening session

on "Multinational Microwave Technology Transfer." This year's MTT-S Symposium contained over 160 technical presentations and four evening panel sessions. MSAT '83 will cost \$100 if you pre-register before January 31, 1983. After the cut-off date, the registration fee will jump to \$150. The non-IEEE member MTT-S Symposium fees were \$75 and \$90 for preregistered and on-site registration, respectively. Certainly, the International Microwave Symposium offers the attendee more for a lower cost. The MSAT '83 organizers do not mention if a conference digest will be published and if its cost, if it will exist, would be included in the registration fee.

The MTT-S Symposium Technical Program Committee relies on nearly ninety experts in their technological areas of expertise, to judge and select submissions for presentation at the annual conference. We have not been informed about reviewers for MSAT '83 presentations.

How about the exhibitors? Where will they choose to exhibit? Most companies do not have unlimited marketing and travel budgets. MSAT '83 will be held three months before the 1983 MTT-S International Microwave Symposium. Both will be held next year on the East coast. Some firms will be able to ship their exhibition material to Washington, D.C. for MSAT '83 and store it on the East coast for use at the MTT-S Symposium three months later. In 1984, the MTT Symposium will be in San Francisco. Where and when will MSAT '84 occur?

Does the microwave community really need an MSAT '83? I don't think so.



SHORT COURSES

High-Speed Integrated Circuit Technology is being offered twice this Fall—September 20-24, 1982 at the University of Maryland, College Park, MD and October 18-22, 1982 at the University of California, Los Angeles, California. The fee for the course is \$875 at the University of Maryland and \$825 at UCLA. Course lecturers include Drs. P. T. Greiling, S. G. Knorr, and C. R. Viswanathan. Contact UCLA Extension, Short Course Program Office, 6266 Boelter Hall, Los Angeles, CA 90024, (213) 825-1295 or 825-3344 or University of Maryland, University College, Conferences and Institutes Program, College Park, MD 20742, (301) 454-4712 or 454-5237.

Also available through the University of California at Los Angeles will be **Modern Radar Technology and Applications**, October 4-8, 1982, and **Synthetic Array and Imaging Radars**, October 25-29, 1982. The coordinator for both courses is Dr. S. A. Hovanessian of Hughes Aircraft Company. Each course has a fee of \$825 per student. For more details, contact the UCLA Extension at (213) 825-3344.

The George Washington University will be presenting **Microwave Systems Planning** (Course No. 832DC), October 25-29, 1982 in Washington, D.C. The course instructor is Dr. Allan Schneider of CyberCom Corp. The course fee will be \$855 per pupil. For more information, contact Continuing Engineering Education Program, George Washington University, Washington, D.C. 20052, (202) 676-6106 or (800) 424-9773 or Telex 64374 (International).

Wideband Communications Systems is another Fall offering from George Washington University. Course 537 DC is being given November 15-18, 1982 for a fee of \$780 per student. The course instructor will be Dr. Bernhard E. Keiser, consultant. Contact Continuing Engineering Education Program, George Washington University, Washington, D.C. 20052, (202) 676-6106 or (800) 424-9773 for additional information.

Two additional short courses are being offered by Continuing Education Institute. **Microwave Circuits: Theory and Applications** will be presented October 4-8, 1982 at the Hyatt Palo Alto, Palo Alto, California and November 8-12, 1982 at the Sheraton-Tara Hotel, Framingham, Massachusetts. The course fee is \$850 per student. The instructors are Les Besser, Robert Wenzel, and Steven March. For further information, contact Continuing Education Institute, 10889 Wilshire Boulevard, Suite 1000, Los Angeles, CA 90024, (213) 824-9545 or at (301) 596-0111.

Microwave Theory and Measurements will be presented November 2-5, 1982 at the Columbia Inn, Columbia, Maryland and November 30-December 3, 1982 at the Hyatt Rickey's Hotel, Palo Alto, California. The fee for the course has been set at \$750 per student. The course instructor is Dr. Stephen F. Adam of Hewlett-Packard Company. For further information, contact Continuing Education Institute in Los Angeles at (213) 824-9545 or in Columbia, Maryland at (301) 596-0111.

Among the courses being offered this Fall by Georgia Institute of Technology is **Microwave and Stripline Design Using Programmable Calculators and Desk-Top Computers**. The course dates are September 20-22, 1982. For \$675, the course fee includes lecture notes, textbook, and a TI-59 programmable calculator. (Deduct \$200 if a TI-59 or comparable calculator can be furnished for the course). For more information, contact Department of Continuing Education, Georgia Institute of Technology, Atlanta, GA 30332, (404) 894-2400.

Other short course offerings this Fall and Winter from Georgia Institute of Technology include: **Radar Cross Section Reduction**, October 6-8, 1982; **Computer Modeling of Electromagnetic Signatures**, October 26-28, 1982; **Electromagnetic Radiation Medical Applications**, November 3-5, 1982; **Principles of Modern Radar**, November 15-19, 1982; **Millimeter Wave Systems and Technology**, January 11-13, 1983; **Modern Microwave Solid State Devices and Sources**, February 1-3, 1983; **Laser Technology and Systems Applications**, March 7-8, 1983; **Infrared Technology and Applications**, March 9-11, 1983. Contact Depart-

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SHORT COURSES (continued from page 35)

ment of Continuing Education, Georgia Institute of Technology, Atlanta, GA 30332, (404) 894-2400 for more details on these upcoming courses.

The Continuing Education Department of the IEEE will be offering **Engineering Considerations for Microwave Communication Systems** in Washington, D.C., November 3-5, 1982. Additional details can be obtained from the Continuing Education Department, IEEE, 445 Hoes Lane, Piscataway, NJ 08854, (201) 981-0060, extension 328 or 329.

Radar Systems Engineering: Detection, Tracking, and Signal Processing is being offered by Continuing Education Institute, November 15-19, 1982 at the Amfac Hotel, Los Angeles, California. The course instructors are Dr. D. M. Stuart, Dr. P. Grieve, and Dr. P. Robinson. For more details, contact Continuing Education Institute, 10889 Wilshire Blvd., Suite 1000, Los Angeles, CA 90024, (213) 824-9545.

Coordinated by G. I. Haddad and P. T. Greiling, **Microwave Solid-State Devices and Circuits** is being offered February 22-25, 1983 at the University of California Los Angeles. In addition to Drs. Greiling and Haddad, lecturers include Drs. D. Maki, D. Peterson, and R. Eisenhart. The fee for the course is \$795. For more information, contact UCLA Extension, Short Course Program Office, 6266 Boelter Hall, Los Angeles, CA 90024, (213) 825-1295 or 825-3344.

RELIABILITY REPORTS

The Fall 1981 issue of the MTT Society Newsletter (Number 101) contained a listing of eight reliability reports prepared under the sponsorship of Rome Air Development Center (RADC), which were of possible interest to the microwave community and which were available to the general public. The July 1982 issue of the Reliability Society Newsletter (Volume 28, Number 3) contained several additional listings.

1. Reliability Evaluation of GaAs Power FETs, Texas Instruments, H. M. Macksey, RADC-TR-80-124 (AD-A086668)
2. Microwave Integrated Circuits Procedures Evaluation, Harris Corporation, F. Belgin, RADC-TR-80-210 (AD-A090677)
3. Reliability Evaluation of GaAs Power FETs, Texas Instruments, H. M. Macksey, RADC-TR-80-390 (AD-A096306)
4. Failure Mechanism Study of GaAs Technology, Hughes Aircraft Co., L. S. Bowma, RADC-TR-81-180 (AD-A104440)

These documents may be obtained by the general public from: National Technical Information Service, Department of Commerce, 5285 Port Royal Road, Springfield, VA 22151, (800-336-4700). U.S. defense contractors may obtain copies from: Defense Technical Information Center, Cameron Station, Alexandria, VA 22314, (202-694-6864).

SPEED LEARNING

What is better than speed reading? Speed learning is a proven, new concept that will at the very least double your reading comprehension skills and your ability to recall the essentials of what you read, while actually cutting your overall reading time by more than a factor of two. Produced by Learn, Inc., this unique multi-media program has been approved by the IEEE Educational Activities Board as a worthy self-study course for members who would like to improve not only their reading speed but their thinking, remembering, understanding, and learning skills as well.

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Dr. Russell G. Stauffer, originator and research director of this program, is a Professor of Education at the University of Delaware and founder and director of the Reading Study Center at the University since 1950. Over 100,000 individuals have completed the Speed Learning program.

The cost to IEEE members is \$99.95, which includes handling and insured delivery. The IEEE Educational Activities Board guarantees a full refund of the purchase price upon return of all of the materials in good condition, within 14 days after delivery. A \$2 billing charge will be added to all non-prepaid orders and New Jersey residents must add five percent sales tax.



INDIA CHAPTER (continued from page 33)

The Chapter also arranged a two day workshop on computer-aided design in microelectronic systems. At this November 9-10, 1981 workshop, four sessions covered modeling, circuit analysis and synthesis, VLSI architecture and design, CAD programs and mask generation.

The India Chapter, as listed in the 1982 MTT Society Committee Directory, needs to be updated to reflect the correct Chapter Chairman. The Directory entry should read: R. K. Arora, Department of Electronics, Government of India, Lok Nayak Bhavan, Third Floor, Prithviraj Lane, New Delhi 110003, India, telephone 624997. The Vice Chairman is Prof. Bharathi Bhat, Indian Institute of Technology, Delhi. Prof. Bhat will become the Chapter Chairman in 1983.

SON OF "NEW BOOKS"

McGraw-Hill Book Company has recently announced three new books of interest to some segments of the microwave community.

Optical Fibre Communication has been written by the technical staff of CSELT (Centro Studi e Laboratori Telecomunicazioni), Italy. The 928 page volume (519 illustrations) was written by 19 researchers. The price of the volume is \$43.75.

Frank F. E. Owen has authored **PCM and Digital Transmission Systems**, the latest in the Texas Instruments Electronics Series. The 295 page book is divided into 13 chapters containing 186 illustrations. The cost of the book is \$30.00.

Also recently published is **Optical Fiber Systems: Technology, Design, and Applications**. The 204 page book by Dr. Charles K. Kao, ITT Electro-Optical Products, contains 10 chapters and retails for \$23.50.

Any of these books can be ordered from McGraw-Hill Book Company, 1221 Avenue of the Americas, New York, NY 10020.

In addition, the British IEE has announced the publication of Volume 14 of its Electromagnetic Waves Series, **Leaky Feeders and Subsurface Radio Communications**. The 320 page volume is authored by P. Delogne and is available case-bound for \$61.00. The book can be ordered from the IEEE Service Center, PPL Department, 445 Hoes Lane, Piscataway, NJ 08854. Include \$2.25 per book for freight charge for all non-prepaid orders.



MEETINGS OF INTEREST

The following list of meetings of potential interest to MTT-S members covers a period of approximately 10 months. All efforts will be made to maintain a complete compilation. Any additions should be sent to the MTT-S Newsletter Editor.

- September 20-22, 1982 are the dates for the **1982 Electronic and Aerospace Systems Convention (EASCON)**, which will be held in Washington, D.C. at the Sheraton Hotel. More details are available from Mr. S. J. Campanella, Comsat Laboratories, Washington, D.C., (202) 428-4258.
- **The European Conference on Optical Communication** will be held September 21-24, 1982 at the Palace of Festivals in Cannes, France.
- Vrije Universitet Brussel, Brussels, Belgium is the site of the **Eighth European Solid State Circuits Conference**. For more information on the September 21-23, 1982 conference, contact Prof. O. Steenhaut, Vrije Universitet Brussel, Pleinlaan 2, 1050 Brussels, Belgium, telephone (02) 6412901.
- Engineering and medicine are the topics of three conferences to be held in Philadelphia, Pennsylvania at the Marriott Hotel during the week of September 20-24, 1982. **The 1982 Frontiers of Engineering in Health Care Conference** will be held September 20-21, 1982. Contact Dr. Alfred R. Potvin, University of Texas at Arlington, Biomedical Engineering Program, P.O. Box 19138, Arlington, TX 76019, (817) 273-2249 for more details. On September 22, 1982, the **Computers in Medicine (COMP MED '82) Conference** will take place. Dr. Morton Schwartz, California State University, Dept. of Electrical Engineering, Long Beach, CA 90840, (213) 498-5102. **The 35th Annual Conference on Engineering in Medicine and Biology** will be held September 22-24, 1982. Additional information is available from the Alliance for Engineering in Medicine and Biology, Suite 210, 4405 East-West Highway, Bethesda, MD 20814, (301) 657-4142.
- **The 1982 International Conference on Circuits and Computers** will be held September 29-October 1, 1982 at the New York Hilton, New York, New York. For more information, contact Charles W. Gwyn, Sandia National Laboratories, Department 2110, Albuquerque, NM 87185, (505) 844-5373.
- The Association of Old Crows is holding its 1982 Convention, **AOC '82**, in San Francisco, October 10-14, 1982. Papers classified Secret will be presented, so current DoD or NATO clearance of the appropriate level is required. For more information, contact AOC '82, Itek Corp., 1101 Maude Avenue, Sunnyvale, CA 94086.
- **Autotestcon, the 1982 IEEE International Automatic Testing Conference** will be held at the Dayton Convention Center, Dayton, Ohio, October 11-13, 1982. More details are available from Oscar Sepp, ASD/AEG, Wright-Patterson Air Force Base, Dayton, Ohio 45433, (513) 255-2996.
- **Plenicom '82 International Telecommunications Exhibition** will take place October 11-15, 1982 at the Kenyatta Conference Center in Nairobi, Kenya.
- The Queen Elizabeth Hotel in Montreal, Canada is the site for the **1982 Canadian Conference on Communications and Energy**. Contact George Armitage, Canadian IEEE Regional Office, 7061 Yonge Street, Thornhill, Ontario L3T 2A6, Canada, (416) 881-1930 for additional information on the October 13-15, 1982 meeting.
- **The First Annual Military Communications Conference** will be held October 17-20, 1982 in Bedford, Massachusetts at Stouffer's Bedford Glen. The conference theme is "Progress in Spread Spectrum Communications." More information can be obtained from Lawrence R. Jeffery, Communications Division, MITRE Corp., P.O. Box 208, Bedford, MA 01730, (617) 271-2172.
- **Radar '82** will be held at the Borough of Kensington and Chelsea Town Hall, London, England, October 18-20, 1982. More information is available from the Secretariat, Conference De-

- partment, Institution of Electrical Engineers, Savoy Place, London WC2R OBL, England, or R. T. Hill, 2802 Birdseye Pl., Bowie, MD 20715.
- **Military Microwaves '82** will be held in London, England, October 20-22, 1982 at the Cunard International Hotel. The first day will be devoted to papers on electro-optics. There will be an associated exhibition. More details can be obtained from Roger C. Marriott, Microwave Exhibitions and Publishers, Ltd., Convex House, 43 Dudley Road, Turnbridge Wells, Kent TN1 1LE, England, telephone (0892) 44027, telex 94604 MEPNCL.
 - **The 1982 IEEE Ultrasonics Symposium** will be held at the Town and Country Hotel, San Diego, California, October 27-29, 1982. Contact Dr. John De Klerk, Westinghouse Research Laboratories, Beulah Road, Pittsburgh, PA 15235, (412) 256-7267 for more details.
 - **The 1982 Government Microcircuit Applications Conference (GOMAC)** will be held in Orlando, Florida, November 2-4, 1982. For more information, contact Palisades Institute For Research Services, 201 Varick St., New York, NY 10014.
 - The twentieth **Automatic RF Techniques Group** meeting will be held November 4-5, 1982 at the Hilton Harvest House Hotel, Boulder, Colorado. The conference's main topic will be Six Port Measurement Systems. For additional information, contact Mario A. Maury, Jr., Maury Microwave Corp., 8610 Helms Avenue, Cucamonga, CA 91730, (714) 987-4715, extension 21.
 - The Asilomar Hotel and Conference Grounds in Pacific Grove, California is the site for the **Sixteenth Asilomar Conference on Circuits, Systems, and Computers**. For more information on the November 8-10, 1982 meeting, contact Dr. Stanley A. White, Rockwell International, P.O. Box 4192, Anaheim, CA 92803, (714) 632-2727.
 - **The 1982 National Telesystems Conference** will be held at the Hotel Galvez in Galveston, Texas from November 8-10, 1982. For more details, contact Dr. Bartus Batson, General Chairman, NASA Johnson Space Center, Mail Code Ee8, Houston, TX 77058, (713) 483-4647.
 - **The 1982 GaAs IC Symposium** will be held November 9-11, 1982 at the Hyatt Regency Hotel in New Orleans, Louisiana. For additional information, contact Dr. Thomas M. Reeder, Program Chairman, Tektronix, Inc., MS 50-370, Beaverton, OR 97077, (503) 627-5496.
 - The International Society for Hybrid Microelectronics will be holding the **1982 International Microelectronics Symposium** at the MGM Grand Hotel in Reno, Nevada. For more information on the November 15-17, 1982 conference, contact Jay L. Kimball, Hytek, 16780 Lark Avenue, Los Gatos, CA 95030.
 - **The 14th Annual Symposium on Optical Materials for High-Power Lasers** will be held November 15-17, 1982 in Boulder, Colorado. For more details, contact Susie A. Rivera, Electromagnetic Technology Division (724.02), National Bureau of Standards, 325 Broadway, Boulder, CO 80303, (303) 497-5342.
 - The Sheraton Bal Harbour Hotel in Miami, Florida is the location for **GLOBECOM '82, The Global Communications Conference**. Contact B. S. Branch, Southern Bell Telephone Co., 666 N.W. 79th Street, P.O. Box 520100, Miami, FL 33152, (305) 263-3362 for additional data on the November 29-December 3, 1982 conference.
 - **MIDCON '82** will be held in Dallas, Texas at the Dallas Convention Center from November 30 to December 2, 1982. Additional information is available from Dale Litherland, Electronic Conventions, Inc., 999 N. Sepulveda Blvd., El Segundo, CA 90245, (213) 772-2965.
 - The Hyatt Regency Hotel in Knoxville, Tennessee is the site of the **1982 Applied Superconductivity Conference**. The conference will be held November 30 to December 3, 1982. For more information, contact Richard D. Blaugher, Westinghouse Electric Corp., Research and Development Center, 1310 Beulah Road, Pittsburgh, PA 15235, (412) 256-3561.
 - **The 1982 International Electron Devices Meeting** will be held December 13-15, 1982 at the San Francisco Hilton Hotel in San Francisco, California. Contact Melissa Widerkehr, Courtesy Associates, 1629 K Street N.W., Suite 700, Washington, D.C. 20006, (202) 296-8100 for more details.
 - The **National Radio Science Meeting** will be held January 5-7, 1983 at the University of Colorado, Boulder, Colorado. Contact Prof. S. W. Maley, Steering Committee Chairman, University of Colorado, Department of Electrical Engineering, Boulder, CO 80309 for additional information.
 - The Georgia World Congress Center in Atlanta, Georgia is the site for **Southcon**. Contact Dale Litherland, Electronic Conventions, Inc., 999 North Sepulveda Blvd., El Segundo, CA 90245, (213) 772-2965 for more information on the January 18-20, 1983 meeting.
 - **The 1983 IEEE Workshop on Micrometer and Sub-micrometer Lithography** will be held January 19-21, 1983 at the Erawan Garden Hotel, Indian Wells, California. More information can be obtained from John P. Reekstin, Rockwell International, Mail Stop BA 33, 3370 Miraloma Avenue, Anaheim, CA 92803, (714) 632-0638.
 - Marsailles, France is the site of the **Seventh Annual Conference on Infrared and Millimeter Waves**. For additional details on the February 14-18, 1983 conference, contact Kenneth J. Button, General Chairman, M.I.T. National Magnet Laboratory, Building NW-14, Cambridge, MA 02139, (617) 253-5561.
 - Sun Valley Lodge in Sun Valley, Idaho is the site of the February 19-26, 1983 **Aerospace Applications Conference**. Contact Dr. Russeil A. Gaspari, Hughes Aircraft Co., Space and Communications Group, Technology Division, 512/V305, P.O. Box 92919-Airport Station, Los Angeles, CA 90009, (213) 648-1325 for more details.

- **The 1983 International Solid State Circuits Conference** will be held February 23-25, 1983 at the Sheraton Center in New York, New York. For additional information, contact Lewis Winner, 301 Almeria Avenue, Coral Gables, FL 33134, (305) 446-8193.
- **OFC '83**, the topical meeting on **Optical Fiber Communication** is scheduled for February 28 - March 2, 1983 at the Hyatt Regency Hotel in New Orleans, Louisiana. There will be a technical exhibition. For additional information, contact OFC '83, Optical Society of America, 1816 Jefferson Place, N.W., Washington, D.C. 20036, (202) 223-8130.
- **The 1983 IEEE Region Six Conference** will be held March 16-18, 1983 at the Marriott Hotel in Albuquerque, New Mexico. Contact Prof. Roy A. Colclaser, EECE Department, University of New Mexico, Albuquerque, NM 87131, (505) 277-5628 for more information.
- **Intermag - the International Conference on Magnetism** will be held April 6-9, 1983 at the Franklin Plaza Hotel, Philadelphia, Pennsylvania. For more details, contact Prof. C. D. Graham, Dept. of Material Science, University of Pennsylvania, 3231 Walnut Street, Philadelphia, PA 19104, (215) 243-8509.
- April 10-14, 1983 are the dates for **Southeastcon**. The conference will be held at the Sheraton Twin Towers Hotel in Orlando, Florida. For more information, contact Russell E. Theisen, Martin Marietta Aerospace, 2667 Fitzhigh Road, Winter Park, FL 32792, (305) 352-3177.
- The University of East Anglia in Norwich, England is the site of the **Third International Conference on Antennas and Propagation**. Contact IEE Conference Secretariat, Savoy Place, London WC2R 0BL, England for more information on the April 12-15, 1983 conference.
- **The 1983 International Society for Optical Engineering Technical Conference** will be held April 18-22, 1983 in Geneva, Switzerland. Contact Joe Yaver, SPIE 1983 Conference, P.O. Box 10, Bellingham, WA 98227, (206) 676-3290 for further information.
- **Electro** will be held at the New York Coliseum and the Sheraton Centre in New York, NY, April 19-21, 1983. Contact Dale Litherland, Electronic Conventions, Inc., 999 North Sepulveda Boulevard, El Segundo, CA 90245, (213) 772-2965 for additional information.
- The Newporter Inn in Newport Beach, California is the site of the **1983 IEEE International Symposium on Circuits and Systems**. For more information on the May 2-4, 1983 conference, contact the Symposium Chairman, Dr. George Szentirmai, Compact Engineering Division, C.G. I.S., 1131 San Antonio Road, Palo Alto, California, (415) 966-8440.
- Walt Disney World in Orlando, Florida is the site of the **33rd Electronic Components Conference**. For additional details on the May 16-18, 1983 conference, contact Thomas G. Grau, Bell Telephone Laboratories, Whippany, NJ 07981, (201) 386-3303.
- **The 1983 National Aerospace and Electronics Conference (NAECON)** will be held May 17-19, 1983 at the Dayton Convention Center, Dayton, Ohio. Contact NAECON, 140 East Monument Avenue, Dayton, OH 45402, (513) 223-6266 for additional information.
- May 17-20, 1983 are the dates for **CLEO '83, Conference on Lasers and Electro-Optics**. The conference will be held at the Baltimore Convention Center, Baltimore, Maryland. Additional information can be obtained from CLEO '83, Optical Society of America, 1816 Washington Place, N.W., Washington, D.C. 20036, (202) 223-8130.
- **The 1983 IEEE Antennas and Propagation Society Symposium** and the **U.S. National Committee of URSI Meeting** will be held at the University of Houston, Houston, Texas, May 23-26, 1983. Contact Dr. Stuart A. Long, Department of Electrical Engineering, University of Houston, Houston, TX 77004, (713) 749-2511 for more information.
- **The 1983 Mediterranean Electrotechnical Conference (MELECON '83)** will be held in Athens, Greece. Additional information on the May 24-26, 1983 conference can be obtained from Prof. E. N. Protonotarios, National Technical University, 42 October 28th Street, Athens (147), Greece.
- **THE 1983 IEEE MICROWAVE AND MILLI-METER-WAVE MONOLITHIC CIRCUITS SYMPOSIUM** will be held May 31-June 1, 1983 at the Boston Sheraton Hotel, Boston, Massachusetts. Contact Dr. Paul T. Greiling, Hughes Aircraft Co., 3011 Malibu Canyon Road, Malibu, CA 90265, (213) 456-6411 for additional information.
- **THE 1983 IEEE MTT-S INTERNATIONAL MICROWAVE SYMPOSIUM** will be held June 1 - June 3, 1983 at the Boston Sheraton Hotel, Boston, Massachusetts. For additional information, contact Harlan Howe, Jr., M/A-COM, Inc., South Avenue, Burlington, MA 01803, (617) 272-3000, extension 1637.
- June 19-22, 1983 are the dates for the **1983 International Conference on Communications**. The convention site is the Boston Sheraton Hotel, Boston, Massachusetts. Contact C. William Anderson, New England Telephone and Telegraph, 350 Cochituate Road, Framingham, MA 01701, (617) 879-9000 for additional information.
- **The Fourth International Conference on Integrated Optics and Optical Fiber Communication (IOOC '83)** will be held June 27-30, 1983 at the Keio Plaza Hotel in Tokyo, Japan. Contact Dr. Melvin I. Cohen, Bell Telephone Laboratories, Room 6D-325, 600 Mountain Avenue, Murray Hill, NJ 07974, (201) 582-6623 or Prof. Humio Inaba, Research Institute of Electrical Communication, Tohoku University, 2-1-2 Katahira, Sendai 980, Japan for more information.



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