



EDITOR: *H. J. Kuno*

Hughes Aircraft Co., 3100 W. Lomita Blvd., Torrance, California 90509

Number 99, Winter 1981



OUTGOING PRESIDENT'S MESSAGE

By Stephen Adam

One of the most exciting ADCOM meetings of the year is the official annual meeting. This year it was held in St. Louis at the Stouffer's Riverfront Towers Hotel. This is the meeting where Society elections are held and next year's Society Awards are voted on. I would like to take this opportunity to congratulate all newly elected and reelected ADCOM members. Ganesh Basawapatna and Ed Niehenke were our newly elected members. Reinhart Knerr, John Kuno, Barry Spielman and George Oltman were reelected. All ADCOM Memberships are for a 3 year term. We also elected Fred Rosenbaum to a 1 year term of Society President and Dick Sparks to a 1 year term of Vice President. All the above mentioned members have contributed significantly to the betterment of our Microwave Society, and I am convinced they will do so in the coming years.

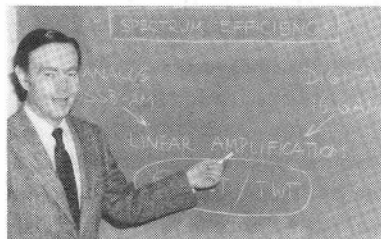
Our 1981 Society Award winners are:

Career Award:	Dr. Kiyo Tomiyasu
Microwave Prize:	Hatsuaki Fukui; "Design of Microwave GaAs MESFET's Broadband Low-Noise Amplifiers"
Applications Award:	Julius Lange; "Lange Couplers"

The 1981/1982 MTT-S National Lecturer was selected after the ADCOM meeting due to Dick Sparks' absence. Dr. Ferdo Ivanek was chosen. He will be talking about Microwave Communications, a very important, timely subject of our days.

At this time I would like to publicly thank Dr. Larry Whicker, past President, Ex-officio, and Prof. Ken Button for their services at their departure from ADCOM. Both Larry and Ken have made many significant contributions during their many years as loyal members of ADCOM.

(Continued on Page 8)



1981/1982 MTT-S NATIONAL LECTURE

By Ferdo Ivanek

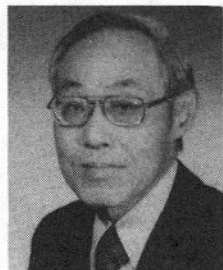
"MICROWAVE COMMUNICATION TECHNOLOGY"

Communications represent the largest microwave market segment, worldwide. Analog terrestrial microwave links carry more than half of the long-distance communications in the U.S. and in most other countries. Growing and diversifying applications led to spectrum crowding, which demanded better spectrum utilization. This is being implemented in two ways: (1) through improvements in the spectrum efficiency, i.e., by increasing the transmission capacity within a given channel bandwidth, and (2) through spectrum sharing between different transmission systems (e.g., terrestrial and satellite). The advent of digital microwave transmission introduced additional elements of complexity. Under these circumstances, the microwave industry faces unprecedented challenges in the development and manufacture of communications equipment, components and devices. The talk is intended to concentrate on technological developments in response to the prevailing operational requirements and competitive pressures.

Most major development efforts are oriented at high-capacity digital transmission in the preferred communications bands below 12 GHz. Microwave power amplification seems to be attracting the greatest attention as GaAs FET amplifiers become increasingly successful in competing with TWTs, but other related development efforts are making significant progress, as well.

Other areas of progress in microwave communication technology to be highlighted in this talk are: the ongoing expansion into the millimeter-wave range, the growing point-to-multipoint transmission requirements, the beginning of commercial spread-spectrum transmission applications, and last—but not least—the continuing progress

(Continued on Page 8)



MICROWAVE CAREER AWARD

KIYO TOMIYASU

"For a career of meritorious achievement and outstanding technical contribution in the field of microwave theory and technique"

Kiyo Tomiyasu, a Consulting Engineer—Microwave Techniques at General Electric Company, was born in Las Vegas, Nevada, on September 25, 1919. His engineering tendencies appeared at an early age and technical challenges have always interested him. While in high school he and his older brother reassembled Model T Ford engines and cars, and also developed a small hydroelectric power plant to generate sufficient 30-volt DC electricity for lighting their family home.

Kiyo received the B.S. degree in Electrical Engineering from the California Institute of Technology in 1940. Technical jobs were very scarce, so he enrolled at Columbia University where he received the M.S. degree in Communication Engineering in 1941. With a Low Scholarship he pursued his doctorate work at Stanford University, but because of the outbreak of World War II he was unable to continue his education there. With the aid of a Gordon McKay Scholarship and research fellowships he later earned his Ph.D. degree in Engineering Science and Applied Physics at Harvard University in 1948.

After a year as Instructor in Electronics at Harvard University he joined the Microwave Research Section under the leadership of Dr. Seymour B. Cohn at Sperry Gyroscope Company, Great Neck, New York. Technical challenges were plentiful there and his first project effort resulted in a high-power annular-ring waveguide rotary joint which permitted the stacking of several channels in parallel and allowed mounting these around a central support mast. Another activity around 1953 was the development of a Ku-band narrow-beam microwave radiometer. Not surprisingly, the radiometer could detect people walking through the beam, but it could also discriminate between male and female pedestrians! When this was mentioned to the secretaries they were disturbed and puzzled by this capability of invisible microwave beams. They even disbelieved the real explanation that the discrimination was based simply on the meter fluctuations which responded to the differences in gait!

In the early 50's many engineers moved to California to accept new challenges and opportunities. Kiyo was one of the many and he joined the newly-formed General Electric Microwave Laboratory in Palo Alto in 1955 as a Consulting Engineer. His work involved microwave components and techniques. The earliest multi-mode measurements of harmonic frequency power propagating in rectangular waveguide was made under his guidance. Other activities involved microwave components based on multipactor discharge.

In 1960, Kiyo and his wife moved back East to Schenectady, New York, where Kiyo became a Consulting Engineer at G.E.'s General Engineering Laboratory. During this transition the technical world was surprised to hear of the successful development of the ruby optical maser. Two types of backgrounds were required for this activity, viz., quantum mechanics and coherent waves. The latter skills were naturally available to microwave engineers. The discovery of the laser occurred at a very opportune time for Kiyo, and several months later he became involved by providing technical coordination of the diverse laser activities at several different laboratories within the General Electric Company. During this period he co-invented a laser involving flat discs of neodymium glass wherein the laser beam is incident on the flat face at Brewster's angle. The basic patent is used in production type laser range finders and for nuclear fusion research.

The peak of activity in lasers had passed when in 1969 Kiyo transferred to General Electric's Valley Forge Space Center near Philadelphia, Pennsylvania. The principal activity entailed satellites, and these were carrying remote sensors operating at visible wavelengths. Sensors operating at infrared wavelengths were then under development and planned to be borne by satellites. It was only natural to exploit and develop remote sensors operating at even longer wavelengths. Passive microwave radiometers and active microwave scatterometers (radar) became his next challenge and a very fortunate one for him. Coarse resolution synthetic aperture radars to observe geophysical parameters from space are quite feasible, and he has been recently involved in their configurational designs.

Kiyo Tomiyasu has acquired 20 U.S. patents, authored 64 papers and 1 book, presented over 100 papers at conferences and seminars, given over 40 talks at various meetings, and has been a session chairman at 18 symposia. Kiyo's direction is toward technical challenges and he feels strongly about publications which inform the professional society of these developments. "Publications disseminate knowledge and they enhance the images of both the author and his company," comments Kiyo. "Everybody who benefits from knowledge acquired from his professional society is obliged to contribute knowledge to that society so that the total store of archival knowledge can be updated."

His dedicated efforts have had its rewards. He was elected to the grade of IEEE Fellow in 1962 for "Contributions to Microwave Theory." In 1962 he was presented a Japanese American Citizens League National Recognitions Biennial Award for Distinguished Achievement, a silver medallion for outstanding achievements in microwave and laser technologies. In 1973 he was elected Honorary Life Member of the MTT-S and of its Administrative Committee with the citation, "For his continued outstanding contributions and services to the IEEE Microwave Theory and Techniques Society."

In 1977, Kiyo was granted a General Electric Company Charles Proteus Steinmetz Award for outstanding individual achievement over a sustained period as evidenced by impact on the company and society. An important part of the Steinmetz Award as a G.E. grant of \$5,000 in his name which was designated to Caltech to establish the Tomiyasu-

(Continued on Page 8)



MICROWAVE PRIZE

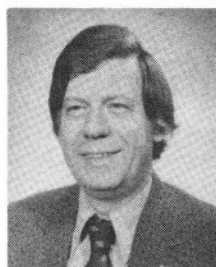
Hatsuaki Fukui

For paper "Design of Microwave GaAs MESFETs for Broadband Low Noise Amplifiers," IEEE Trans on Microwave Theory and Techniques, Vol. MTT-27, pp. 643-650, July 1979

HATSUAKI FUKUI was born in Yokohama, Japan. He was graduated summa cum laude in electrical engineering from Miyakojima Technical College, Osaka, Japan, and received the Doctor of Engineering degree in electrical engineering from Osaka University, Osaka.

From 1949 to 1954 he did research work on microwave electron tubes at Osaka City University, Osaka, and in the following year had industrial experience in the field of microwave test equipment with Shimada Physical and Chemical Industrial Company, Tokyo, Japan. In 1955 he joined Tokyo Tsushin Kogyo (the former name of Sony Corporation), Tokyo, to be engaged in the semiconductor field as a pioneer. Until 1960 he headed a group developing new transistors for use in radio and television receivers, and then was in charge of the entire Esaki tunnel-diode operation in the Semiconductor Division. A year later he was appointed Manager of Advanced Technology Department in the Engineering Division, concerning future generations of consumer electronics. In 1962 he joined Bell Telephone Laboratories, Murray Hill, New Jersey. First, he worked on microwave semiconductor devices, such as Ge and Si bipolar transistors, GaAs bulk-effect devices and Si avalanche diodes, and their circuit applications. Second, from 1966 to 1973 he was engaged in research and development of electro-optical devices and subsystems for future PICTUREPHONE® use, which included storage tubes, cathode-ray tubes, phosphors, plasma display devices, Si diode-array camera tubes, and charge-coupled imaging devices. He also supervised the development of new techniques for the vacuum-deposition of III-V compounds. Third, since 1973 he has been involved in the GaAs FET development project, working on device modeling, designing, fabrication, characterization, and reliability. He is the author or co-author of three technical books and some 60 articles in Japanese, and of approximately 40 technical papers published in English.

Dr. Fukui is a Senior Member of the IEEE, a member of the Microwave Theory and Techniques Society serving on the Editorial Board, and a member of the Electron Devices Society serving for the IEEE Standards Committee (P642) on Microwave Transistors Characterization. He was a member of the Steering Committee of the Institute of Television Engineers of Japan from 1973 to 1974. He was a recipient of the Inada Award from the Institute of Electrical Communication Engineers of Japan in 1960. He has been listed in Marquis' "Who's Who in the World" and other biographical references.



MICROWAVE APPLICATIONS AWARD

Julius Lange

For the development of the interdigitated microstrip quadrature hybrid—the Lange Coupler

Julius Lange received his B.S. degree in Engineering Physics in 1959 and M.S. degree in Physics in 1960 from University of Oklahoma. He then received his Ph.D. degree in Electrical Engineering, Southern Methodist University, 1971.

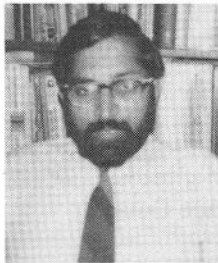
Between 1960 and 1965, Dr. Lange was employed with the Semiconductor Device Development Department of Bell Telephone Laboratories, where he worked on: fabrication of gallium arsenide transistors; Hall and resistivity measurements on thin films; radiation testing of transistors; design and testing of nanosecond switching circuits; and microwave transistor characterization. From 1965 to 1973 he was associated with Texas Instruments Incorporated. As a senior member of the technical staff of the Microwave Components Program Branch of the Semiconductor Research and Development Laboratory, he had responsibility for the design and performance evaluation of microwave transistors and circuits. His assignments included: improved device analysis techniques involving correlation between physical structure and high frequency parameters; package and test fixture design; noise and S-parameters measurement techniques; computer aided device characterization; computer aided design of microwave wideband amplifiers, directional couplers and filters; design of microwave integrated circuits on ceramic substrates; and package design. In the Advanced Development Department of the Radar Systems Division of Texas Instruments he worked on varactor multipliers and parametric amplifiers. For a brief period from February to October 1971, Dr. Lange was employed at Collins Radio as senior engineer in the Solid State Power Amplifier Advanced Development Group of the Telecommunications Systems Engineering Division.

From 1973 to 1979, Dr. Lange was associated with the Western Laboratories Division of Ford Aerospace Corporation as Senior Engineering Specialist in circuit design and system analysis. His assignments included: digital satellite communications receivers for rates up to 1000 Megabits per second, an adoptive baseband equalizer, and computer aided design of GaAs FET amplifiers. In October 1979 Dr. Lange joined the Mobile Communications Business Division of the General Electric Company as Consulting Engineer. He is presently working on the AMPS cellular mobile telephone system.

Dr. Lange is a graduate of the "Communications Development Training Program" of Bell Telephone Laboratories, and of the "Modern Business Program" of the Alexander Hamilton Institute. He has published papers in the Journal of Applied Physics, the IEEE Journal of Solid-State Circuits,

(Continued on Page 8)

NEW ADCOM MEMBERS



BASAWAPATNA

GARNESH R. BASAWAPATNA was born at Tirunelveli, Tamil Nadu, India, in September, 1942. He received the B. Tech. (Hons.) degree in Electronics and Electrical Communication Engineering from the Indian Institute of Technology, Kharagpur, in June, 1963, and the M.S. degree in Electrical Engineering from the Illinois Institute of Technology, Chicago, in June, 1964.

From 1965 to 1967, he was with the Research Division of Johnson Controls, Milwaukee, Wis. Here he worked on computerized environmental control algorithms for large buildings and developed an interest in microwaves working on a Doppler intrusion detector source. He joined the Micro State Electronics subsidiary of Raytheon Company in 1967. Here he initially worked as a development engineer designing wideband VTOs, varactor and step-recovery diode multipliers and phase-locked sources. He then worked in the area of GaAs IMPATT diode circuits developing device equivalent circuits, noise models, and designing mechanically and electronically tuned IMPATT sources.

In 1971 Mr. Basawapatna left his position as manager of the microwave sources group at Micro State to be a founder of Star Optics Corporation, Warren, N.J. The founders attempted to start a company to exploit the advantages of GaAs IMPATT diode circuits, but failed to raise sufficient capital. They also designed some gem cutting and polishing machines and ran an artificial gem business.

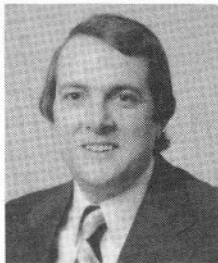
In 1972 Mr. Basawapatna joined Hewlett-Packard Company. At H.P. he has been involved with the design of wideband bipolar and MESFET amplifiers covering frequency ranges up to 20 GHz, YIG tuned wideband oscillators, YIG tuned multipliers and other microwave control components, for use in the company's instruments.

Since November, 1980, he has been operating as a consultant on microwave components and subsystems.

EDWARD C. NIEHENKI, (M 61) was born in Abington, PA., on August 5, 1937. He received the B.S. (1961) and M.S. (1965) degrees in Electrical Engineering from Drexel University, Philadelphia, Pennsylvania.

From 1961 to 1963, he was employed by Martin Marietta, Baltimore, Maryland, where he was engaged in the investigation of solid-state device behavior and low-loss superconducting delay lines at cryogenic temperatures.

Since 1963, he has been employed by Westinghouse Electric Corporation, Baltimore, Maryland, responsible for the development of low-noise broadband parametric amplifiers, FET amplifiers, limiters, voltage controlled oscillators, FET dielectric resonator oscillators, mixers and miniature



NIEHENKI



MEET NEW MTT-S PRESIDENT

Fred J. Rosenbaum

FRED J. ROSENBAUM was born in Chicago, Illinois, on 15 February 1937. He grew up there and attended the University of Illinois first in Chicago (at Navy Pier), and then at the Urbana campus. He received the B.S. (1959), the M.S. (1960), and the Ph.D. (1963) degrees in electrical engineering from that institution. From 1963 to 1965 Dr. Rosenbaum was a research scientist at the McDonnell Aircraft Corp., St. Louis, MO.

In 1965 he joined the Electrical Engineering Department of Washington University, St. Louis, where he now holds the rank of professor. At the University he established a research group in the area of microwave devices whose projects have included studies in the Gunn effect, propagation in non-reciprocal structures (ferrite and semiconductor loaded waveguides and microstrip transmission lines), ferrite circulators and phase shifters, microwave bio-effects, GaAs FETs and millimeter-wave semiconductor devices. He has authored some forty odd technical papers, given numerous talks, and holds three patents.

Dr. Rosenbaum has been active in the IEEE. He has been a member of the MTT ADCOM since 1970 and served as Vice-President of that body. He was editor of the IEEE Transactions on Microwave Theory and Techniques from 1972-1975. In 1979 he was a member of the IEEE Delegation to the Popov Society and in 1980 was recognized as a D.E. Evans Visiting Fellow at the University of Queensland, Brisbane, Australia.

Dr. Rosenbaum is married and has two daughters.

NEW ADCOM MEMBERS (Cont.)

microwave integrated circuits. He is presently a Fellow Engineer engaged in the research and development of FET phase shifters and broadband FET VCO's. He holds three patents in the microwave area. He has had three papers published and has presented three papers at National Symposia.

Mr. Niehenke is a registered professional engineer in the state of Maryland. He has held the positions of facilities chairman, secretary/treasurer, and chairman of the IEEE Baltimore Chapter AP/MTT. He is a Director for the IEEE Baltimore Section and is a member of the IEEE/MTT Waveguide Standards Committee. With the assistance of MTT-S ADCOM he organized the 1980 MTT Advanced Radar Technology one-day symposium.



CHAPTER ACTIVITIES

By R. A. Sparks

Reports that have been received from Chapters over the past several months suggest a great deal of planning is in progress for interesting technical meetings and seminars during the balance of the year.

The Washington, D.C. chapter has formulated a seven lecture course entitled, "Microwave Devices in Circuits" that began in October and ends in April.

This course will be part of the MTT-S 1980-81 lecture series. The lectures begin at 7:30 PM on the second Tuesday of each month at the University of Maryland, Center of Adult Education, College Park, MD. The following schedule has been planning:

DATE	TOPIC
October 14, 1980 (7:45 PM start due initial registration)	Overview of Course and Passive Components
November 11	Designing with S-Parameters
December 9	Conventional Microwave Tubes (TWT, etc.)
January 13, 1981	Relativistic Microwave Tubes (Gyrotron, etc.)
February 10	One Port Active Devices and Circuits (FETs, etc.)
April 14	Monolithic Microwave Circuits

"Microwave Devices and Circuits," by Prof. Samuel Y. Liao, will be the course text. The text will be distributed on October 14 beginning at 7:00 PM. Registration (including text) is \$40. For further information, call one of the Chapter Officers: Al Friend, Chairman, 652-4861; John Jacobi, Vice Chairman, 427-5125/5287/5255; or Jim Douglas, Secretary, 734-4100.

The San Francisco/Santa Clara chapter has scheduled a one-day short course for March 1981, entitled "Advanced Microwave Techniques for Commercial Applications." Further details can be obtained by contacting the present chapter chairman:

Mr. Chi Hsieh, (415) 592-4120
Harris/Farion Electric
1691 Bayport Avenue
San Carlos, CA 94070

Finally, the Boston chapter is planning a one-day seminar that will include invited speakers and a workshop on the subject, "Millimeter Wave Technology." Additional information can be obtained from incumbent chapter chairman.

Dr. Apostle (Butch) Cardiasmenos
Alpha Industries
20 Sylvan Road
Woburn, MA 01801 (617) 935-5150

The new officers of the MTT-S Tokyo chapter beginning January 1, 1981, are:

Chairman Dr. Yoshihiro Konishi
NHK Technical Research
Laboratories
1-10-11 Kinuta, Setagaya-ku
Tokyo 157, Japan
Telephone: (03) 415-5111

Vice-Chairman Professor Eikichi Yamashita
University of Electro-
Communication 14,
Kojima-cho, Chofu-shi, 182,
Japan
Telephone: (0424) 83-2161

Secretary/Treasurer Mr. Yozo Utsumi
NHK Technical Research
Laboratories
1-10-11 Kinuta, Setagaya-ku
Tokyo 157, Japan
Telephone: (03) 415-5111

The joint AT/ED/MTT-S chapter in Israel, chaired by Dr. Asher Madjar, sent in the following report for 1980:

The activities of our chapter this year include four technical meetings, as well as providing assistance to the section in the organization of MELECON, the International Mediterranean Electrotechnical Conference (to be held in May 1981).

The technical activities took place as follows:

- 1) April 15 — A one-day technical meeting held in the Techion, Israel Institute of Technology in Haifa. Five technical papers were presented (45 minutes each): Two on microwave components, one on adaptive antenna and two on electron devices; 31 participants.
- 2) June 12 — A talk on VLSI technology held in the meeting room of ELBIT in Haifa, after which the audience was taken to the design facilities of INTEL in Haifa; 35 participants.
- 3) October 12 — The third bi-annual Symposium of the chapter held in Herzlia; 16 technical papers presented on microwave components, antennas, radomes, etc. The opening talk was presented by a guest lecturer: Dr. J.C. Wiltse from Georgia Institute of Technology. His talk was on "MM Waves for the 80's." 150 participants.
- 4) October 13 — A one-day course on MM Waves held in Herzlia. The course was given by Dr. J.C. Wiltse. Dr. Wiltse presented all the aspects of MM Waves: Propagation, antennas, radiometers, radar, communication and components; 70 participants.

The two vice-chairmen of the Israeli chapter are Dr. Ehud Navon and Avinoam Kolodny.

This chapter activities report is my last as chairman of the Membership Services Committee. I would like to acknowledge the support I have received from the many chapter chairmen I have worked with during the past 5 years and look forward to the opportunities and challenges that my new office as Vice President of MTT-S has to offer.

HIGHLIGHTS OF ADCOM MEETING

OCTOBER 27 AND 28, 1980
ST. LOUIS, MO.

By F. J. Rosenbaum

The fall meeting of ADCOM was held in St. Louis, on 27, 28 October 1980, at Stouffers Riverfront Inn, the tentative site of the 1985 MTT-S International Microwave Symposium. The meeting was called to order at 8:00 P.M., the principle business being the election of officers and new ADCOM members for 1981. The results of the election were:

President:	Fred Rosenbaum
Vice President:	Dick Sparks
ADCOM Members:	R. Knerr
	G. Oltman
	B. Spielman
	G. Basawapatna (new)
	E. Niehenke (New)

MTT-S is fortunate that we have a large body of well qualified and active members willing to serve on ADCOM. Efforts are made to balance ADCOM geographically and members are sought to represent industry, government, and academia. Elections always present hard choices, but over the years MTT-S has been well served by its elected ADCOMs.

After the election a number of action items were debated. Funds were advanced to the steering committees of the Boston and Los Angeles Symposia for planning and advance costs. These funds and any surplus are returned to MTT-S after the Symposia. A proposal to hold the 1984 Symposium in San Francisco was received and accepted. Since our annual get-together has grown to such proportions long-range planning is required to get the needed hotel and exhibit space. ADCOM also elected to sponsor the 1981 Symposium on Infrared and Millimeter-Waves to be held in Miami Beach in December, 1981. Ken Button has been indefatigable in integrating the MM-Wave Conference with MTT-S activities.

Also passed was a motion relevant to pre-symposium publicity. The microwave trade magazines have been anxious to report on the program and content of the Symposium, prior to the meeting. The newly accepted ADCOM policy states the rules under which the Symposia Steering Committees are to respond to publicity requests, what materials are to be released, and what the Symposium authors rights and privileges are regarding copyright restrictions, prudence, etc. This information will be released to authors and the media after the upcoming Technical Program Committee meeting.

This portion of the meeting adjourned at 11:34 P.M. and ADCOM reconvened at 8:33 A.M. the following morning.

In response to the excellent reception of the Historical Exhibit at the 1980 Symposium ADCOM voted to establish an Historical Exhibits Subcommittee whose purpose is to create and maintain a permanent collection of microwave memorabilia and to arrange for its exhibition at our Symposium. Ted Saad was named the first Curator of the

exhibit. Anyone having objects, photos, books, etc., for donation, should contact Ted.

Hal Sobol reported the Awards Committee's recommendations which were discussed and voted upon. This year's winners of the coveted MTT-S awards are:

Career Award:	Dr. Kiyo Tomiyasu
Microwave Prize:	Dr. H. Fukui for "Design of Microwave GaAs MESFETs for Broadband Low-Noise Amplifiers"
Applications Award:	Julius Lange for the "Lange" directional couples

Congratulations to all!

Reinhard Knerr, Transactions Editor reported on the state of the journal and a 1981 budget of 1500 pages was voted. The Transactions are in good shape under Reinhard's able Editorship.

The remainder of the meeting was devoted to various committee reports and discussion. Harlan Howe reported that a new contract with Horizon House was negotiated for the management of the Symposium Exhibition through 1984 with an option for 1985. The Washington Symposium was a great success and Larry Whicker detailed the events, technical, social, financial and otherwise, in his report. A surplus of \$60 K was turned in by Larry and his associates of the Washington Steering Committee.

Planning for the Los Angeles meeting is well in hand, according to Don Parker. An item of notice for successful Symposium authors is that if they desire their manuscripts to be considered for inclusion in the December 1981 Symposium Issue, they must submit the completed manuscript by March 15, 1980.

Barry Spielman reported that work on an MTT-S brochure is nearly done. The purpose of the brochure is to aid in attracting new members, student members, and as an information item for release to the media, etc., when meetings and symposia are being advertised.

A long range planning issue, discussed for more than a year was finally laid to rest. Fred Rosenbaum detailed the issue of a two-year term for ADCOM president. There are several benefits to this. Firstly, the president has a chance to learn this job more completely. Secondly, MTT-S relations with TAB would be facilitated if the President were a member of TAB for a longer period. On the other hand, since ADCOM membership is restricted to no more than three successive terms, each of three-year duration, there would be fewer opportunities for many qualified people to serve as president. Furthermore, the burdens of office are significant, both to the President and to his institution. It was felt that it would not be reasonable to expect employers, generally, to cheerfully support a two-year term. Finally, it was felt that if both the president and vice president attended TAB meetings throughout the year, our interests would be well protected. To this end a travel budget will be debated at the January ADCOM meeting.

Jim Degenford reported that our finances were in excellent shape. MTT-S currently has an uncommitted surplus of \$264K. Our 1980 budget projects the expenditure of \$295.9 K. Our surplus funds are invested by IEEE and the earnings on these funds is returned to the MTT-S budget.

(Continued on Page 7)

TAB MEETING REPORT

By Stephen Adam

The last Technical Activities Board (TAB) meeting of 1980 was held in Orlando, Florida on December 3-4, at the Dutch Inn. Actually, on the 3rd, we've tried a new event, Society/Group/Council President's Forum. It was a very successful meeting, chaired/moderated by Dick Emberson. The intent was to have freely flowing rap-session without the rigid agenda imposed at the TAB meetings.

Bob Larson, Vice President-TAB, greeted the forum, then Larry Wilson, VP-RAB (Regional Activities Board), and Dick Gowen, VP of USAB, addressed us talking about Chapter/Section/Society relations, and United States Activities Board relations, respectively. Thaddeus Regulinski, President of the Reliability Society, discussed training of Society/Council officers. The annual S/G/C President's Orientation will be extended to cover actual "do's" and "don't's" and other management training aspects of volunteer officers by past S/G/C officers. It was also agreed, that this should be held at the December TAB meeting to take full advantage of training the then newly elected VP/President elects. The Society Operating Manual will also be updated yearly and sent to all ADCOM members. A book of "Job Descriptions" will also be developed to clarify the rights and duties of ADCOM Officers/representatives.

Don Brereton, Institute finance chairman, and Jack Ryder, chairman of centennial preparations passed out buttons reading "1984 is right now," meaning that everyone should start preparing for the celebration. (AIEE was founded in 1884, IRE and AIEE merged in the early '60's and formed IEEE.) There will be historical exhibits at all major IEEE events in '84. They asked each Society to assign a Centennial Committee to prepare a paper on the history of their Society and print it in the first issue of the 1984 transaction. Other celebrations are also recommended: Award at the '84 symposium of the very best papers in Society's history; write a centennial technology document; develop an historic exhibit (we have one, thanks to Ted Saad, and will coordinate with Headquarters).

An interesting discussion followed in generating guidelines and procedures for approving new societies and councils. The main discussion centered around the highly controversial issue of the application to elevate CSIT (Committee on Social Implications of Technology) from Committee to Society. The opposing arguments were: 1) Social implications of technology is not a technical field and it affects all societies, maybe a council status is more appropriate; it should be handled in the area of Professional Activities (that cannot be, since USAB is a national entity, not transnational, social implications are transnational in nature); 2) SSIT should be to allow an internal organ within TAB to have a voice and keep everyone honest. They have over 2,000 paid newsletter readers within the Institute. At the TAB meeting the resolution to allow CSIT to be elevated to a Society passed with a single vote majority.

A great deal of time was spent discussing the proposal to allow the use of cameras and tape recorders at all conferences. The following resolution was passed by TAB:

"TAB recommends to the Board of Directors that Policy Statement 9.6E should read as follows: Tape recording and photography are normally considered permissible at open sessions of IEEE meetings. However, at technical meetings restrictions on the use of such equipment may be allowed by the responsible Society/Council or Section where appropriate, i.e., where they may impede free discussion, where they compromise commercial value or where they are disruptive. Such sessions should be clearly identified in advance."

Two new transactions were approved: Transactions on computer aided design of integrated circuits and systems; transactions on medical imaging.

Financing of a film on non-ionizing radiation was discussed, which is being developed by COMAR. Government and non-effected industry grants are being sought (approximately \$150K-\$200K).

Proposal to the formation of IEEE Power Electronics Council passed (MTT will be represented).

TAB chairman, Vice President Larson, provided some interesting statistics on how IEEE is becoming more transnational. While only 17% of the total membership is non-U.S., the average S/G/C membership's 28% is foreign, MTT-S has 30.3% non-U.S. membership.

The restructuring of TAB divisions was proposed to realign more evenly the division membership. The number of divisions are proposed to be increased from 7 to 10 with the following proposed names: I. Signals & Systems; II. Instrumentation & Applications; III. Communications Technology; IV. Electromagnetics & Radiation; V. Computers 1; VI. Computers 2; VII. Power Engineering; VIII. Biological & Geophysical Systems; IX. Cybernetics, Management & Education; X. Devices and Material. This is tentative. MTT-S is in Division IV, Electromagnetics & Radiation. We will have to think on this and discuss it at the January ADCOM meeting. Do we want to be further identified with radiation; should we change the name of the Division or look for another fit with other Societies, such as: Division X, Devices and Material with ED, QEA, SU, EI, and SSC?

Your inputs are welcome!

HIGHLIGHTS OF ADCOM MEETING (Cont.)

We are in far better shape than was the case just five years ago.

Larry Whicker is retiring from long years of service to MTT-S. Steve Adam is now moving to the Past President's Council. ADCOM's and MTT-S' thanks go to both of them for the outstanding efforts each has made on our behalf.

The Fall ADCOM was adjointed at 3:00 P.M.

MTT-S NEWSLETTER, WINTER 1981

MICROWAVE CAREER AWARD

(Continued from Page 7)

GE Scholarship for the furtherance of education to a student majoring in engineering or science. Upon receiving these awards, he comments, "I couldn't have made these accomplishments strictly by myself, but I had the good fortune of having concerned parents, inspiring teachers, supportive managers and co-workers, and encountered numerous selfless members of the professional society."

Kiyo himself is the epitome of scholarship, but what of his personal life? While at Harvard, he met his San Francisco-born wife, Eiko, at an Easter Sunrise Service at the Charles River, and they've been in all 50 states, in several European countries, Mexico, Australia, Asia and the Caribbean. During his spare time he may be found caring for his potted plants, many of which are tropical and sub-tropical plants started from seeds acquired from his travels. He has a banyan tree in a pot that has to be dwarfed since a banyan tree in the open can become immense like the world's largest one in India which is 700 feet in diameter.

MICROWAVE APPLICATIONS AWARD

(Continued from Page 6)

the IEEE Transactions on Circuit Theory, and IEEE Transactions on Microwave Theory and Techniques, and the IEEE Transactions on Electron Devices.

Dr. Lange has held the office of publicity chairman for the 1969 International Microwave Symposium and the office of program chairman for the Dallas GMITT chapter.

He is married and has an eight year old daughter.

OUTGOING PRESIDENT'S MESSAGE

(Continued from Page 1)

Since this is my last president's message before I turn over the baton to the next president, Fred J. Rosenbaum, I'd like to take a moment to remember and say thanks to all the ADCOM members, committee chairmen and members and, in general, to all MTT-S membership for their help they have given me in this passing year. MTT-S is a strong society with close to 30 years of history. We have contributed significantly to the "Body of Knowledge" and I am sure we will continue doing so for many years to come. In the past year we held our largest and best symposium yet in our nation's capitol, Washington, D.C. Our chapters are very active, our technical committees provide the necessary leadership to assure the technical excellence we are enjoying. As we are starting a new decade, many new challenges are before us. We will have to deal with new political and economical changes. As leaders of our segment of the engineering profession we will tackle all the problems and come out solving many of them as we did in the past three decades.

I am very grateful to all of you for the opportunity to serve you. It was a great honor and experience that I will always remember. I will continue to provide my services to the Society in whatever way I can in the future.

1981/1982 MTT-S NATIONAL LECTURE

(Continued from Page 1)

in the development of analog microwave transmission equipment.

Terrestrial microwave communications owe their initial rapid growth to the availability of the previously developed radar technology, and they continue to benefit from this and from the other areas of military and commercial microwave systems development, including satellite communications which introduced a new element of competition. The more recent development of microwave receivers for direct satellite broadcasting promises to bring about new designs and manufacturing techniques that could be advantageously applied to equipment for terrestrial microwave communications, especially in reducing manufacturing cost. These important interrelationships deserve special mention in the lecture.

To schedule the National Lecture, write or call:

Ferdo Ivanek
Harris Corporation
Farinon Electric Operation
1691 Bayport Avenue
San Carlos, California 94070
(415) 592-4120, Ext. 129

A balanced presentation requires broad international coverage to properly reflect the geographical distribution of the microwave industry and of the MTT membership. The lecturer, therefore, depends on inputs from MTT members worldwide, and hereby solicits their contributions. While most recent unpublished data is of greatest value, potential contributors should feel free to send in any information they consider to be particularly well suited for the purpose, including 36mm slides.

Ferdo Ivanek is Manager, Microwave Radio and Multiplex Development, at the Farinon Electric Operation of the Harris Corporation, San Carlos, California. His previous associations in California include the Fairchild R&D Laboratory and the Microwave Laboratory of Stanford University.

Born in Yugoslavia, Ferdo Ivanek obtained his Dipl. Ing. and Dr. Techn. degrees in Electrical Engineering from the Technical University of Vienna, Austria in 1948 and 1965, respectively. His consecutive associations with the R&D laboratories of the Yugoslav Broadcasting and PTT organizations, and of the Iskra Corporation included management in planning the first major Yugoslav radio-relay link, and in developing the first domestically manufactured microwave communication equipment. He also taught at the EE Department, Split, of the University of Zagreb, where he was appointed as Associated Professor.

Ferdo Ivanek is a Senior Member of the IEEE and a member of the Sigma Xi Society. He served as Chairman of the Santa Clara Valley Chapter of the MTT Society, and is currently Chairman of the Microwave Systems Committee (MTT-16). He also serves on the IEEE Solid-State Circuits Council as representative of the Communications Society. His active participation in the CCIR includes the first chairmanship of the Study Group 9 Working Group on Radio-Relay Systems for Developing Countries. He published over 40 articles and one book chapter, and hold one patent.



EDITOR'S NOTE

By H. J. Kuno

At the start of a new year, it is time to reflect and resolve. The MTT-S is approaching the matured age of 30 years. However, new areas of microwave technology are continually emerging; millimeter-waves, FET's, and integrated circuits are the current new technology interests. System applications of microwaves are also rapidly expanding into various areas such as ground and space communications, radars, radiometers, scientific and industrial instrumentations, microwave ovens, intrusion alarms, and automatic door openers. Selections of the National Lecturers reflect the current technology trends. For the 1981/1982 season Ferdo Ivanek has been called upon to lecture on the current development in the field of "Microwave Communications Technology" following Robert Pucel on "Microwave Monolithic IC's," James Wiltse on "Millimeter-Waves," Charles Leichti on "FET's" and John Osepchuk on "Biological Effects of Microwave Radiation."

The MTT-S is an organization run by volunteers who are keenly interested in technological progress and the welfare of microwave communities. The addition of new volunteers with fresh ideas is essential to keep the organization "young" as it approaches its 30th year. In the Administrative Committee, one-third to one-half of the six eligible seats to be elected are filled by new members each year. This year Ed Niehenke and Garnish Basawapatna have been added to the ADCOM.

Each year we recognize significant contributions of microwave engineers to the field. It gives me personal pleasure to acknowledge this year's Microwave Career Award recipient. Kiyo Tomiyasu has contributed so much in so many ways to the microwave field and society both technically and professionally as outlined in this Newsletter. Congratulations also go to Hatsuaki Fukui, the winner of the Microwave Prize, and Julius Lange, the recipient of the Application Award.

Since this issue is my last as editor before I pass the baton to the next editor, Steve March, I'd like to take a moment to acknowledge those whose skillful assistance was essential to put together the Newsletter. In particular, my secretaries Gloria Vigil and Ivette Villar, Wayne Ragland and members of the Publications group at the Hughes Electron Dynamics Division, and a team at the Jensen Printing lead by Hideo Katayama made my job more manageable. The editor's accomplishments depend on the news items he receives from various contributors. Therefore, I wish to thank all the contributors that made my job more enjoyable. I have truly enjoyed my involvement in the Newsletter. I'll be contributing to the Newsletter in my new capacity as Chairman of Membership Services Committee. This committee assists local chapters and MTT-S

POLICY ON PRE-RELEASE OF MICROWAVE SYMPOSIUM PAPERS FOR NON-IEEE PUBLICATION

By H. Howe

BACKGROUND

In the past several years, there has been some confusion on the appropriateness of pre-symposium release of the technical papers for advanced publicity purposes.

While ADCOM recognizes the contribution of the microwave trade magazines in stimulating interest and attendance at the annual IEEE MTT-S Microwave Symposium, the publication of major segments of a technical paper prior to the symposium thwarts the purposes of the symposium, could be detrimental to its attendance, and violates IEEE Copyright Policy.

Therefore, for the 1981 Symposium and all future symposia, the following policy has been adopted:

Policy

1. Copies of the full text of papers submitted to the symposium will not be released prior to the symposium for non-IEEE publication.
2. Pre-symposium publicity may be provided by the Symposium Steering Committee Publicity Chairman in cooperation with the Technical Program Committee Chairman. This information may be derived from a) the 35-word abstracts submitted by each author, b) any previously published information concerning the symposium, including the schedule of papers and other contents of the Advanced Program Booklet, c) information on the individual sessions and promotional paragraphs written by the Session Organizers, d) promotional material prepared by the Technical Program Committee Chairman outlining the results but not the details of any papers which are considered to be particularly newsworthy.
3. Authors may be contacted directly by non-IEEE publishers and are free to provide additional information. Due to the IEEE Copyright Agreement signed by the authors, it is necessary that such information be supplemental and not identical to the material which will be published in the Digest. However, the release of supplemental information may jeopardize the acceptance of the paper for future IEEE publication. If additional information is required, contact:

Harlan Howe, Jr., Chairman
Meetings & Symposia
MICROWAVE ASSOCIATES, INC.
South Avenue, Building No. 2
Burlington, Massachusetts 01803
(617) 272-3000, X-1637

members and selects National Lecturers. If you need assistance or have suggestions on how the committee can serve the MTT-S members better, please let us know.

History of MTT

by Ted Saad

ADCOM XI

JULY 1, 1962 THROUGH JUNE 30, 1963

By Ted Saad

ADMINISTRATIVE COMMITTEE:	S.B. Cohn, Chairman
	D.D. King, Vice Chairman
	E.N. Torgow, Secretary-Treasurer
B. D. Aaron	R.A. Rivers
H.M. Altschuler	S.W. Rosenthal
T.N. Anderson	T.S. Saad
R.W. Beatty	J.L. Yen
A.C. Beck	G. Shapiro
G.L. Matthaie	K. Tomiyasu
W.W. Mumford	R.D. Wegenroth
A.A. Oliner	
HONORARY LIFE MEMBERS	G.C. Southworth
	A.G. Clavier
EX OFFICIO MEMBERS	Frank Klawnsnik
	R.F. Schwartz

The Chairman of the eleventh ADCOM was Seymour Cohn, the Vice-Chairman was Don King and the Secretary-Treasurer was Gene Torgow. In addition to his duties as Vice-Chairman, Don King continued to serve as editor of the Transactions through the January 1963 issue, after which he was replaced by Bob Beatty. Gus Shapiro continued as Newsletter editor.

The IRE-AIEE merger into the IEEE, effective January 1st, 1963, had considerable impact on the 11th ADCOM. A letter from Dr. Ernst Weber, the first president of the IEEE, urged the MTT to minimize its anticipated deficit for the year. In line with this, the IEEE publication subsidy for MTT was held at \$8,000. The implication was that publishing would have to be limited, unless MTT was willing to apply its surplus to compensate for the reduced subsidy. The point was made by Dr. Dick Emberson, the professional group secretary of the IRE, that the ADCOM was not required to cut its publication, but the subsidy was reduced. The number of pages in the Transactions were reduced, but not drastically.

A problem resulting from the merger of the two organizations was the fact that they operated using two quite different structures. Where the IRE had professional groups, the AIEE had technical committees. To help ease the difference the two were combined and a new name, Professional Technical Groups, was adopted for both.

To help further combine the two, a list of suggested areas of interests and scopes was circulated to all of the professional (technical) groups. Chairman Seymour Cohn reviewed the areas and recommended the Basic Sciences and Techniques group for PTG MTT. One recommendation was the idea of grouping the professional technical groups in division-like structures.

Early in the ADCOM year, Don King reported that Bob

Beatty had agreed to accept appointment as his successor as editor of the Transactions. Don continued as editor through the January 1963 issues. One matter of serious concern relative to the Transactions was the subject of attracting laser papers. A number of suggestions were offered, including actively soliciting papers from authors who have published good papers, publishing a bibliography of laser papers, publishing a survey article on lasers, and publishing both a survey and bibliography.

An interesting item, perhaps a harbinger of the future, was the fact that the number of papers being contributed to the Transactions by foreign authors was increasing. This was considered desirable, since it was felt the papers contributed from outside the United States would broaden the scope of interest of the membership.

The Newsletter continued to make its presence felt under the guidance of Gus Shapiro. Despite his constant exhortations, the contribution from ADCOM members was minimal at best. The major contents of the Newsletter during that period came from the ADCOM Minutes, Symposium reports and local chapter reports.

Two MTT members were honored by the IRE, Dr. George Southworth received the Medal of Honor and Leonard Lewin received the W.R.G. Baker Award for his paper entitled, "On the Resolution of a Class of Waveguide Discontinuity Problems by the Use of Singular Integral Equations." The paper appeared in the July 1961 issue of the MTT Transactions.

One committee that received a lot of attention during the 11th ADCOM was the Membership Committee under the leadership of Bob Rivers. As of September 30, 1962 there were 5896 members. The concern was that membership had not increased appreciably over the last few years. A number of suggestions for stimulating added membership were made and some were put into practice. One in particular was the use of display posters with return envelopes attached distributed to local chapters around the country. In addition, the January issue of the Newsletter included a tear-out membership application.

The Handbook of Administrative Committee Procedures was finally completed by Hal Altschuler and 100 copies were printed by Headquarters and were made available to other ADCOMs.

The budget for the 11th ADCOM faced a number of problems. Some of the problems came about because of the merger, other problems resulted from the changeover to a machine-billing system, and still another problem relative to the MTT itself was the fact that the IEEE financial figures were kept on a calendar year, whereas the ADCOM operated from July 1 to June 30th. As a consequence, fiscal detail as reported was out of synchronization with the ADCOM itself by six months. There was a great deal of confusion during the year relative to what the actual figures were. Despite that, perhaps the best assessment of the actual financial status of the MTT was the statement made by Gene Torgow, the Treasurer, that it was "good."

The matter of Symposia occupied a good deal of the attention of the ADCOM. One historical note not reported in the last chapter of this tome is the fact that the 1962 Boulder Symposium saw the appearance of the first digest published by a Symposium committee. The publication

contained a complete program with abstracts. It was about 6" x 8½" and contained 179 pages of text.

The 1963 Symposium was held in Santa Monica, California, under the chairmanship of Dean Anderson. Attendance was 589, including several attendees from England and France. A Symposium Digest was again published, and this time institutional listings were included in the Digest to help defray expenses. 58 companies supported the Digest in that fashion. Len Lewin won the Microwave Prize for his paper, which also won the W.R.G. Baker Award. The net income of the Symposium was \$1,166.88.

At the September meeting of the 11th ADCOM, the Long Island Chapter of PGMTT received approval to hold the 1964 Symposium on Long Island with Saul Rosenthal as Chairman.

During the 11th ADCOM, Professor K. Morita wrote to Art Oliner concerning a microwave meeting to be held in Japan in 1964. The official title of the meeting was "International Conference on Microwaves Circuit Theory and Information Theory - Japan 1964." Although the IRE agreed to cooperate with the Symposium Committee, it did not sponsor the effort. The Professional Group on Information Theory also indicated interest in cooperating with the Tokyo Symposium Committee.

A Millimeter Wave Symposium was held in Orlando, FL on January 9th and 10th, 1963. This caused some concern in the ADCOM, because of their feeling that it would create a conflict of interest with the MTT Symposium proposed by the Orlando section. It was also planned by the Millimeter Wave Symposium and ADCOM that the MTT would publish suitable papers in an issue of the Transactions. Ultimately, the papers appeared in the September 1963 issue. After heated discussions, it was agreed that the ADCOM would cooperate, but not co-sponsor the Orlando meeting. However, the MTT mailing list was made available to the meeting, with the restriction that the MTT would not share in the mailing expense. Despite concern on the part of some ADCOM members, the meeting was successful and most of the attendees felt that it was worthwhile. The major concern of the ADCOM at the time was the feeling that such a meeting, sponsored at the local level, did not fill a need which already existed and for which a forum was missing. Furthermore, it was felt that meetings which are national in scope should be subject to greater control by the national ADCOM. It was concluded, therefore, that an ADCOM policy should be established to provide leadership in the planning of Symposia and conferences on special subjects beyond the treatment given to such subjects as the annual Symposium.

MTT again took part in the 1963 (nee IRE, now) IEEE Convention. MTT was allotted 2½ sessions. One of the sessions was devoted to the subject of high power. Only 13 papers were submitted, 5 of which were rejected. The high power session was made up of 5 invited papers. The fact remained, however, that the interest in the IEEE Convention as a technical meeting was continuing to diminish.

The ADCOM received a letter from the Polytechnic Institute of Brooklyn inviting it to co-sponsor a Symposium on Optical Lasers. The invitation indicated that MTT would participate primarily by handling mailings to its members. The only expense to MTT would be the mailing cost. For

its participation, MTT members would receive a \$1 discount for the Symposium Proceedings.

A letter was received from Dr. Richardson of N.B.S. proposing that MTT set up a Microwave Measurements Survey Group. The matter was discussed by the ADCOM at length. The request was forwarded to Dr. Emberson for his views on the subject. Although the ADCOM felt that the proposed group would fall within the scope of interest of the MTT, it was also felt that the objectives of the Microwave Measurement Survey Group were more akin to those of the IRE Standards Committee. However, there was general agreement that the objectives of the survey group were desirable, but it was noted that the magnitude of the work involved was so great, the MTT ADCOM could not really undertake the project. One suggestion was that NBS should establish such an advisory group and MTT could recommend qualified people to serve.

One of the concerns of the Organization Committee, chaired by Kiyo Tomiyasu had to do with proposals for (putting out to pasture?) ex-Chairmen. Ten items were included in the proposal. Key among them was the recommendation that ex-chairmen have ex-officio status for three years beyond the term of office as Chairman. It was recommended that he be outside the quorum at ADCOM meetings, that he be eligible to serve on standing and Ad Hoc committees, and that he would have full voting rights on all ADCOM business. The proposals were referred to the Constitution and By-Laws Committee to be drafted as proposed changes in the by-laws and to be discussed at a future meeting.

An item of new business was the possibility of the formation of a Professional Technical Group on Lasers. The inquiry was presented by R.A. Kaplan of Wheeler Labs. In the ensuing discussion a motion was made that a Committee be established to recommend whether or not the PTGMTT area of interest should be interpreted and enlarged to include lasers, fiber optics and quantum electronics.

At the March meeting of the ADCOM, the annual election was held and 6 members were elected to the new ADCOM beginning July 1st 1963. They were Hal Altschuler, Al Beck, Ted Marino, John Pippin, Ted Saad and Gene Torgow. Don King was elected Chairman of the new ADCOM with Hal Altschuler as Vice-Chairman.

How will the trauma of a name change from PGMTT to PTGMTT, the merger of its parent society with the AIEE into the IEEE and the concern for added financial burdens affect the MTT? Will it continue to function and prosper? Will the changes and challenges act as a stimulus, or will the ADCOM stumble? Was Don King a wise choice as Chairman, or for that matter, Hal Altschuler as Vice-Chairman? Will Bob Beatty succeed as editor? Can Bob Rivers increase membership? Who will go to Tokyo? Where is Long Island? These questions and more will be answered in future chapters of this Saga!

GUEST EDITORIAL

R.S. ELLIOTT

EM: A SIMPLIFIED PRESENTATION

Educators enjoy speculating about how much simpler it would be to impart knowledge if we could start over — if there were one agreed-upon international language — if there were but one system of weights and measures, etc. A more focused question in this vein which has intrigued me for some time is this: Supposing it were possible to start from scratch and construct an electromagnetic theory, how would one do it in order to maximize clarity for the student? My personal answer to that question is sketched in the following paragraphs. If it stimulates reactions from readers of this Newsletter, responses will be most welcome.

First, I would eliminate the concepts of the permittivity and permeability of free space. This does not mean setting $\epsilon_0 = 1$ and $\mu_0 = 1$, as in the esu and emu systems, while still giving them dimensions. It means eliminating the concepts altogether. It is surprising the simplifications which result just from this small step. At the outset, it suggests that Coulomb's law be written in the form

$$\vec{F} = q \sum_{n=1} q_n \frac{\vec{R}_n}{4\pi R_n^3} \quad (1)$$

This equation serves to define charge, which can be expressed in charge-units (or some more appealing name, such as Smiths). In an MKS system, if two charged particles of one charge-unit each are placed one meter apart in free space, they will exert a force on each other of $1/4\pi$ newtons. (The factor 4π is placed in Coulomb's law so it does not show up in Maxwell's equations).

The remainder of electrostatics would proceed conventionally from (1). But with charge defined in this manner, the Biot-Savart law for time-independent magnetic fields becomes

$$\vec{F} = q \frac{v}{c} \times \sum_{n=1} q_n \frac{v_n}{c} \times \frac{\vec{R}_n}{4\pi R_n^3} \quad (2)$$

The analogy to (1) is evident, and it is satisfying to see how the speed of light enters as a normalized constant for all velocities.

The next innovation is more drastic. Let current density be defined by

$$\vec{J} = \rho \frac{v}{c} \quad (3)$$

with ρ the volume density of charge-units and with \vec{J} expressed in current-units per square meter. If (3) is used in the continuum equivalent of (2), all of magnetostatics can be developed in the usual way, but the analogies to electrostatics are striking, as can be seen from Table I.

Analogies, when they are not contrived, can be a boon to the student. My view is that such is the case here. Additionally, the analogies serve to eliminate the B versus H confusion so prevalent in the teaching of magnetostatics. It is clearly unnecessary (and undesirable) to introduce either D or H until materials are discussed, and the logical pairing of B with E, and of H with D are now unmistakable. But another considerable simplification in the theory is evident from this table. There are only four different electrical quantities that need to be given names: the charge-unit, the current unit, the field-unit, and the potential-unit. This is because the elimination of μ_0 and ϵ_0 , plus the decision to define current density by (3), has resulted in E, D, B, H, P, and M having common units and dimensions; the same remark is true for Φ and A.

Finally, Maxwell's equations assume the canonical form

$$\vec{\nabla} \times \vec{E} = - \frac{\partial \vec{B}}{\partial (ct)} \quad \vec{\nabla} \cdot \vec{D} = \rho \quad (4)$$

$$\vec{\nabla} \times \vec{H} = \vec{J} + \frac{\partial \vec{D}}{\partial (ct)} \quad \vec{\nabla} \cdot \vec{B} \equiv 0$$

Equations (4) are valid in material media as well as in free space. Some interesting consequences are: (1) the impedance of free space is dimensionless and has the value unity; (2) the inferred stored energy densities are $(\frac{1}{2})E^2$ and $(\frac{1}{2})B^2$ in free space; (3) Poynting's vector becomes $(\frac{1}{2c}) E \times H^*$.

To me, this representation is cleaner. It is stripped of extraneous factors and the equations take on forms throughout the theory that are appealing because they heighten the analogies. It is unrealistic to assume that the scientific community would adopt this system since it would require abandoning well-established units of measure. But it might be desirable to consider teaching electromagnetic theory this way, and then use a conversion table to find the equivalent Coulombs, amperes, or volts[†]. It is an interesting speculation.

[†] I have prepared such a table and will provide it to anyone who is interested.

TABLE I
ANALOGIES BETWEEN ELECTROSTATICS AND MAGNETOSTATICS

		Electrostatics	Magnetostatics
Free Space	Source Element	q	$q \underline{V}/c$
	Force Law	$\underline{F} = q\underline{E}$	$\underline{F} = q(\underline{V}/c) \times \underline{B}$
	Field/Source Integral Form of Force Law	$\underline{E} = \int_V \rho \frac{\underline{R}}{4\pi R^3} dV$	$\underline{B} = \int_V \underline{J} \times \frac{\underline{R}}{4\pi R^3} dV$
	Field/Source Integral Relation	$\oint_S \underline{E} \cdot d\underline{S} = \text{Charge Enclosed}$ (Gauss' Law)	$\oint_C \underline{B} \cdot d\underline{\ell} = \text{Current Enclosed}$ (Ampere's Circuital Law)
	Field/Source Differential Relations	$\nabla \cdot \underline{E} = \rho \quad \nabla \times \underline{E} \equiv 0$	$\nabla \cdot \underline{B} \equiv 0 \quad \nabla \times \underline{B} \equiv \underline{J}$
	Potential/Source Integral Relation	$\Phi = \int_V \frac{dV}{4\pi R}$	$\underline{A} = \int_V \frac{\underline{J} dV}{4\pi R}$
	Potential/Source Differential Relation	$\nabla^2 \Phi = -\rho$	$\nabla^2 \underline{A} = -\underline{J}$
	Field/Potential Differential Relation	$\underline{E} = -\nabla \Phi$	$\underline{B} = \nabla \times \underline{A}$
Materials Present	Source Element in Material	\underline{p}	\underline{m}
	Potential Due to Material	$\Phi = \int_S \frac{\underline{p} \cdot d\underline{S}}{4\pi R} + \int_V \frac{(-\nabla_s \cdot \underline{p}) dV}{4\pi R}$	$\underline{A} = \int_S \frac{\underline{m} \times d\underline{S}}{4\pi R} + \int_V \frac{(\nabla_s \times \underline{m}) dV}{4\pi R}$
	Introduction of a Second Field Vector	$\underline{D} = \underline{E} + \underline{P}$	$\underline{H} = \underline{B} - \underline{M}$
	Field/Source Relations	$\nabla \times \underline{E} \equiv 0 \quad \nabla \cdot \underline{E} = \rho - \nabla \cdot \underline{P}$ $\nabla \times \underline{D} = \nabla \times \underline{P} \quad \nabla \cdot \underline{D} = \rho$ $\oint_S \underline{D} \cdot d\underline{S} = \text{Primary Charge Enclosed}$	$\nabla \cdot \underline{B} \equiv 0 \quad \nabla \times \underline{B} = \underline{J} + \nabla \times \underline{M}$ $\nabla \cdot \underline{H} = -\nabla \cdot \underline{M} \quad \nabla \times \underline{H} = \underline{J}$ $\oint_C \underline{H} \cdot d\underline{\ell} = \text{Primary Current Enclosed}$

DAMON AND LUCKY ELECTED TO IEEE POSTS FOR 1981

New York — Dr. Richard W. Damon, Director of the Applied Physics Laboratory, Sperry Corporation's Sperry Research Center, Sudbury Massachusetts, and Dr. Robert W. Lucky, Director, Electronic and Computer Systems Research Laboratory, Bell Laboratories, Holmdel, New Jersey, have been elected 1981 President and Executive Vice President, respectively, of the Institute of Electrical and Electronics Engineers (IEEE).

Drs. Damon and Lucky were unopposed in their candidacies. Of the 161,000 members eligible to do so, 22% voted.

On January 1, Dr. Damon will succeed 1980 IEEE President Dr. Leo Young, Staff Consultant of the Electronics Technology Division of the Naval Research Laboratory in Washington, D.C. Dr. Young will continue as a voting member of the Board of Directors as Junior Past President.

During his Presidential campaign Dr. Damon stressed the importance of continued technical excellence as the cornerstone of IEEE activities. He also urged Institute participation in social and political arenas in order to provide an authoritative voice in matters concerning technological issues.

Active in IEEE affairs since 1944 and named a Fellow in 1968, he has served in both technical and professional activities. Included among these have been: member of the Board of Directors as a technical division director, 1978-79, and chairman of the Ad Hoc Committee on Registration, and of the Audit Committee, 1978-79. Dr. Damon has also served on the Educational Activities and the United States Activities Boards and on a number of technical and publishing committees.

Dr. Damon has been with the Sperry Research Center since 1962 and prior to that was with General Electric Research Laboratories, the Raytheon Company and Microwave Associates. He holds undergraduate, masters and doctoral degrees in physics from Harvard University. Dr. Damon is currently supervising projects in such areas as fiber optics, ring laser gyroscopes, magnetic disk recording materials, and surface acoustic wave devices. In addition to his work with Sperry, Dr. Damon has served on advisory committees with NASA, the National Bureau of Standards and the Department of Defense.

Dr. Robert W. Lucky, 1981 IEEE Executive Vice President, succeeds Dr. C. Lester Hogan, former Vice Chairman of the Board and now Technical Advisor to the President of Fairchild Camera and Instrument Corporation in Mt. View, California.

While campaigning for office, Dr. Lucky supported liberalizing IEEE admission criteria to include young software people. In the professional area he has shown a particular concern over the professional needs of the older engineer.

An IEEE member since 1955 and named a Fellow in 1972, Dr. Lucky's principal activities with the Institute have been in technical publishing activities. In 1978-79, he

served on the Board of Directors as Vice President of Publications and was also president of the Communications Society of the IEEE. He has served as Past editor of the *IEEE Proceedings* and as assistant editor of the *IEEE Transactions on Information Theory* and on *Communications*. He was elected to the National Academy of Engineering in 1978.

Dr. Lucky joined Bell Laboratories in 1961 as a member of the technical staff and was named to his present directorship in January, 1979. An expert in digital communication techniques, Dr. Lucky holds a number of patents, has published papers and a textbook, and has lectured extensively on the subject. He earned his bachelors, masters and doctoral degrees from Purdue University.

STEERING COMMITTEE

Al Clavin, Chairman
Hughes Aircraft Company
Building 268/A-55
Canoga Park, CA 91304
(213) 702-1778

Seymour Cohn, Vice Chairman
300 South Glenroy Avenue
Los Angeles, CA 90049
(213) 472-5206

Leo A. Mallette, Secretary
Hughes Aircraft Company
Building 359/D330
P.O. Box 92919
Los Angeles, CA 90009
(213) 647-8337

Sam Sensiper, AP-S Coordinator
6011 Holt Avenue
Los Angeles, CA 90056
(213) 645-2970

Dean Anderson, Member-at-Large
8521 Colima Road
Whittier, CA 90605
(213) 693-4946

TECHNICAL PROGRAM

Don Parker, Chairman
Hughes Aircraft Company
Building 268/A-54
Canoga Park, CA 91304
(213) 702-1483

John Kuno Vice Chairman
Hughes Aircraft Company
P. O. Box 2999
Building 230/2011C
Torrance, CA 90509
(213) 534-2121 X2407

Rolf Weglein, Special Sessions
Hughes Aircraft Company
Building 268/A-54
Canoga Park, CA 91304
(213) 702-1328

FINANCE

George Oltman, Chairman
Hughes Aircraft Company
Building 268/A-54
Canoga Park, CA 91304
(213) 702-2293

PUBLICATIONS

Jorg Raue, Chairman
EL/EE Department
Calif. Polytechnic University
San Luis Obispo, CA 93407
(805) 546-2781

ARRANGEMENTS

Chuck Swift, Chairman
15216 Burbank Boulevard
Van Nuys, CA 91411
(213) 989-1133

Bernard Gunshinan, Vice Chairman
Hughes Space & Communications
P. O. Box 92919
Building 366/V-346
Los Angeles, CA 90009
(213) 674-8744

PUBLICITY

Harry Pomeranz, Chairman
Hughes Aircraft Company
Building 268/A-54
Canoga Park, CA 91304
(213) 702-2462

EXHIBITS

Jerry Aukland, Chairman
Rockwell International
Mail Sta. DC 17
33070 Miraloma Avenue
Anaheim, CA 92803
(714) 632-1028

Howard I. Ellowitz, Liaison
Horizon House
610 Washington Street
Dedham, MA 02026
(617) 326-8220

REGISTRATION

Tom Bristol, Chairman
Hughes Aircraft Company
P. O. Box 3310
Building 600/E-248
Fullerton, CA 92634
(714) 871-3232 X24756

LADIES PROGRAM

Dolly Swift, Chairman
Myrna Olsson, Vice Chairman
15216 Burbank Boulevard
Van Nuys, CA 91411
(213) 989-1133

**1981 IEEE/MTT-S****International
Microwave
Symposium****Bonaventure Hotel
Los Angeles
California****JUNE 15, 16, 17, 1981****PLAN TO ATTEND
JOINT MTTS, APS, URSI SYMPOSIUM****JUNE 15 THRU 19****OVER 200 TECHNICAL PAPERS****OVER 130 EXHIBITORS****COME TO
LOS ANGELES —****LADIES PROGRAMS
BANQUET, COCKTAIL HOUR
AWARDS, WORK SHOPS
AND LOTS MORE****FOR INFORMATION CONTACT
MEMBERS OF STEERING COMMITTEE**



THE INSTITUTE OF
ELECTRICAL AND
ELECTRONICS
ENGINEERS, INC.

Non-Profit Organization

U. S. POSTAGE

PAID

PERMIT No. 20683
LOS ANGELES, CALIF.

Third Class



0176180 F
THEODORE S SAAD
3 HURON DR
NAT ICK

17N ***
DEC 16
MA 01760