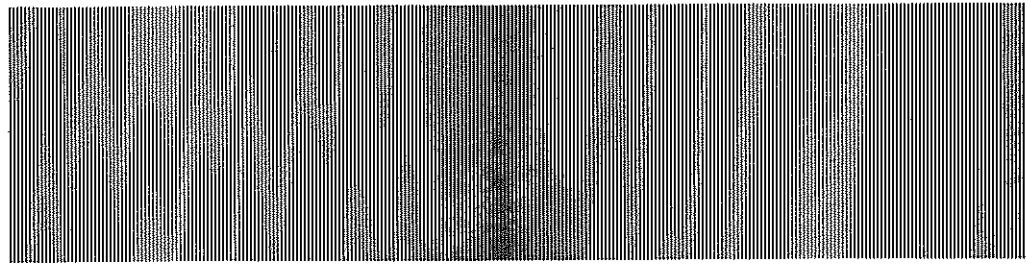


# MICRO WAVE NEWS



Vol. I No. 3

A Monthly Report on Non-Ionizing Radiation

March 1981

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### STOP PRESS

The New York State Workers' Compensation Board upheld Yannon decision and award. Details next month.

## *RARE BLOOD DISORDER LINKED TO MICROWAVES*

An Army pathologist has observed an association between microwave exposure and polycythemia, a rare blood disorder. Polycythemia victims suffer from an excess of red blood cells, and are believed to stand an increased risk of developing leukemia.

Dr. Hylar Friedman, a pathology resident at the William Beaumont Army Medical Center in El Paso, Texas, reported his observation in a letter to the *New England Journal of Medicine* (February 5, 1981). Friedman's preliminary analysis indicated an incidence rate of three cases per year, or 18.7 per 100,000 men over forty—as compared to an average rate of 1.5 to 5.6 per 100,000 men between the ages of 40 and 59. Friedman himself identified seven male patients with polycythemia, who had “strong histories of past and present chronic exposures to microwaves.”

The letter took the microwave research community by surprise. No prior connection between microwaves and polycythemia had been reported; many scientists have been directing their attention to the white rather than the red blood cells. As one researcher pointed out, the finding may not be so hard to explain since both types of cells originate in the bone marrow.

Dr. Charlotte Silverman of the Bureau of Radiological Health (BRH) in Rockville, Maryland, a co-author of the only epidemiology of Navy radar workers (*American Journal of Epidemiology* 112, 39, 1980), said that she found the letter “extremely interesting,” and that BRH would be following up this new lead. The letter prompted Silverman to check the data in her radar study: she found no indication of polycythemia as a cause of death or as a secondary condition. She noted that there were some leukemias among the radar workers, but that poly-

*(continued p. 5)*

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## *ANSI News*

### **Committee Fails to Agree on New RF/MW Safety Standard**

Meeting in New York City on February 26, 1981, the C95 Committee on Radio Frequency Radiation Hazards of the American National Standards Institute (ANSI) could not agree on a new RF and microwave safety standard. Professor Saul Rosenthal of the Polytechnic Institute of New York, the C95 chairman, sent the standard back to Subcommittee IV in a final attempt to reach consensus. Now Professor A.W. Guy of the University of Washington will try some new language, and circulate it among the subcommittee members before bringing it back to the full Committee for approval.

*Microwave News* will have a full report on the ANSI meeting and the sources of disagreement in our next issue.

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# VIDEO DISPLAY TERMINALS

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## Editorial Note

As the items that follow show, VDT operators continue to worry about radiation emissions from their sets. A central question in this controversy is: where does the radiation come from and what are its characteristics?

There is general agreement that the flyback transformer circuit, which has a fundamental frequency of 15 to 20 kHz, is the principal source of the radiation. (This frequency corresponds to the number of lines the machine traces a second.) The number and strength of the associated harmonics is less certain, however. Some sources said that the harmonics frequencies vary up to the 100 kHz range, while others say they may go even higher.

Dr. Samuel Hopfer, vice-president and director of R&D at the General Microwave Corporation in Farmingdale, New York, offered the following explanation for the distribution of the harmonics frequencies. They depend on the flyback or retrace time, that is the time interval in which the voltage goes from the full value to its starting value: the faster the retrace time, the richer the content of the harmonics. Normally the higher harmonics have a weaker intensity. A precise frequency distribution can only be experimentally determined with a spectrum analyzer. Furthermore, according to antenna theory, as you increase the frequency, the possibility of radiation emissions also increases. (This relationship only holds up to a point: in this case somewhere above 50 MHz.)

Microwave News will continue to cover this story, and invites comments on the question posed above.

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## RADIATION MEASUREMENTS

### Holiday Warning

Holiday Industries of Eden Prairie, Minnesota, has issued a bulletin warning against the use of its HI-3001 E-field probe to measure VDT radiation. The company bulletin (#026), dated January 26, 1981, reads:

#### WARNING!!!!

#### DO NOT ATTEMPT TO MEASURE E-field levels

around video display terminals, television sets or any CRT. All of these units do emit low frequency, low level signals and do have a relatively high voltage which can induce false readings into the HI-3001 monitor. Any significant field strength can be characterized as having most of its energy spectrum well below the usable frequency range of the HI-3001 E-field probe. These fields will cause a reading, however, at this time it does not appear that this reading can be related to a meaningful value.

(According to the Holiday HI-3001 specification sheet, the meter's range is 0.5 MHz to 300 MHz.)

### New York Post

In a survey of 16 VDTs at the *New York Post* on January 12, the National Institute for Occupational Safety and Health (NIOSH) recorded a 1500 V<sup>2</sup>/m<sup>2</sup> reading at a Harris 1740 terminal with a Holiday HI-3001 meter. Levels of about 500 V<sup>2</sup>/m<sup>2</sup> were found at several Burroughs terminals. The significance of these readings is uncertain, however, since the HI-3001 is not recommended for measuring frequencies below 0.5 MHz. (See above.) Dr. Wordie Parr and Bill Murray of NIOSH's Physi-

cal Agents Effects Branch in Cincinnati, who took the readings, had not seen the manufacturer's warning.

Parr had initially planned to investigate the terminals, although NIOSH does not think the reported levels pose any health risk. The high readings from the Harris particularly perplexed Parr because it is a solid state model, without a flyback transformer that is the usual source of radiation (15 kHz) emissions from VDTs.

NIOSH must now re-evaluate the *Post* results. In an interview last month, Murray said, "We are aware of measurement problems with VDTs, but we have not seen the Holiday warning letter. We are reconsidering our measurement data." Instrumentation clearly poses difficulties. Murray confessed, "We still don't know which meter to measure VDT radiation with."

### Shields: Metal v Plastic

Radiation measurements from three VDT models used at the *Lexington Herald-Leader* in Kentucky have prompted the Newspaper Guild to recommend installing protective metallic shields around all plastic-cabinet VDT models as a precautionary measure.

NIOSH recorded high readings from the back of Ontel OP-1 and OP-1/16 and Systems Integrated ET960 models last August while measuring a sample of the *Herald-Leader's* VDTs. NIOSH dismissed these measurements as false readings, however, and concluded that there was no radiation hazard. The levels were attributed to electrical interactions between the Narda 8619 meter and the flyback transformer of the units. (NIOSH Technical Assistance Report 80-105-757, October 1980)

The Guild is not convinced the machines are safe. David Eisen, research and information director for the union, issued a memo to local presidents this January advising them to insist on either a shield for the Systems Integrated model, or a test indicating no radiation leaks exceeding 1 mW/cm<sup>2</sup>. The Guild had already made this recommendation for the two Ontels and another plastic-bodied model, the *TeleRam* 2277 Mark 1, after NIOSH tests found the same high readings from these terminals. Eisen stated, "By this time, it is clearly possible to generalize this recommendation to apply to all plastic-cabinet VDTs."

### Montreal Gazette

Radiation readings from VDTs at the *Montreal Gazette* have alarmed the paper's unions despite government assertions that VDTs do not pose a health risk.

Quebec's Ministry of Environment, using a Raham Model 4 meter, checked about 24 *Gazette* VDTs on January 7. The readings were very low except for those taken from plastic-bodied Sperry-Univac UTS 400 and PSI Lobbyist (portable) models. According to John Saunders, a business reporter at the *Gazette*, some measurements from these models went "right off the dial"—over 20 mW/cm<sup>2</sup>.

Since these measurements were taken, the VDTs in question have been rigged with makeshift aluminum foil shields. A second check made on January 21 showed these effectively reduced these readings except for one terminal.

The significance of the initial measurements, however, is disputed. Dr. Maria Stuchly, an expert at the federal radiation protection bureau in Ottawa, insists the Raham meter must have been out of order. "There is no other explanation," she said. The Ottawa bureau did extensive tests on the same type of VDTs at the *Gazette's* Ottawa office and recorded only low levels.

### UK Survey

The United Kingdom's National Radiological Protection Board has completed a comprehensive field survey of all types of VDTs currently manufactured or marketed in the UK. More than 200 different termin-

## HEALTH EFFECTS

als were tested for radiation emissions from the RF through the X-ray frequencies.

The maximum recorded readings were: X-ray: less than 10 micro-rems per hour; UV: none detected above 336 nanometers and 12.4  $\mu\text{W}/\text{cm}^2$  otherwise; visible: 0.25  $\text{mW}/\text{cm}^2$ ; near IR: 5  $\mu\text{W}/\text{cm}^2$ ; far IR: only hot body radiation.

In the microwave and radiofrequency range, a reading of 0.5  $\text{mW}/\text{cm}^2$  was found at one unit using a Narda 8300, while all the rest gave readings below 0.1  $\text{mW}/\text{cm}^2$ . (The Narda's frequency range is 300 MHz-18 GHz.) Using a Raham 12 meter, 14 terminals gave responses greater than 10  $\text{mW}/\text{cm}^2$ , with the maximum "approaching" 100  $\text{mW}/\text{cm}^2$ . Using an EFS 1 meter, 39 units gave readings over 200 V/m, with a maximum over 300 V/m.

An outside contractor tested four of the terminals that had indicated electric field intensities above 300 V/m with a spectrum analyzer. The measurements, taken close to the line output transformer, showed field intensities above 1000 V/m at the fundamental and harmonics frequencies of the line scan frequency up to about 150 kHz. On all the units, the level fell rapidly to 1 V/m between 150 kHz and 3 MHz and to less than 0.2 V/m at 30 MHz. (The electric and magnetic field measurements were equivalent.)

The detailed readings were consistent with those taken with the EFS 1 meter and led the Board to conclude that the Raham 12 readings were "spurious."

E.A. Cox reported these results in his paper, "Radiation Emissions from Visual Display Units," presented at the Loughborough University conference last December. Given that an operator would be exposed to less radiation than that measured under test conditions of properly functioning VDTs, Cox concluded that "the radiation normally emitted from a VDU (video display unit) does not pose a hazard to operators either in the long or short term."

## STUDIES

### Mount Sinai Study

The Newspaper Guild and the Mount Sinai School of Medicine in New York City have announced plans for an epidemiological study of the health effects of VDTs. The study, coordinated by Dr. Arthur Frank at Mount Sinai, will include eye examinations, radiation tests, and a survey questionnaire. Approximately 2,000 employees, including both VDT users and controls, from four to six Guild locals will participate.

A questionnaire developed by Mount Sinai's Environmental Sciences Laboratory with assistance from the Guild will be tested soon at the Vancouver-New Westminster and the Los Angeles Newspaper Guilds. The full survey should begin this summer or fall.

If the questionnaire response indicates a need, Mount Sinai will seek funds for an additional study phase of full medical examinations for affected employees.

Charles Perlik, Jr., president of the Newspaper Guild, believes the study should help to determine if VDTs are responsible for eye damage or other radiation effects.

### Baltimore Sun Study

Ophthalmological tests are underway in a study of VDT operators at the Baltimore Sun. Dr. Shiro Tanaka of NIOSH is conducting the study in cooperation with the local Newspaper Guild, which requested the investigation, and the Baltimore Typographical Union.

The study includes a brief questionnaire and eye examinations performed by the University of Maryland. Up to 500 union members will be tested by mid-April. Tanaka says a report on the study results may be issued as early as this July. (See also *Columbia Journalism Review* story, March/April 1981.)

### Toronto Star Follow-Up

News that four women working on VDTs at the *Toronto Star* had given birth to children with defects stirred widespread concern last summer. Calls requesting radiation checks for VDTs flooded the radiation protection service of Ontario's Ministry of Labor. The anxiety continued even after the Ministry's measurements of all 296 terminals at the *Star* failed to find any radiation.

The cause, if there is one linking the four defects, has remained undiagnosed. Checks for insufficient ventilation and hazardous chemicals have also turned up nothing.

John Brooks, director of communications at the *Star*, stressed that the paper "will take whatever further and reasonable steps are necessary to reassure our own employees and the public that there are no known environmental factors at the *Star* that contribute to birth abnormalities." This year the *Star* will consult three health experts, including an epidemiologist, for recommendations on possible ways to settle this case.

The announcement of this decision closely followed criticism from the City's Department of Public Health of the paper's initial follow-up study. After the Department ruled out radiation from VDTs as a possible cause of the defects last June, Dr. Murray Cathcart, the *Star*'s medical director, prepared a lengthy questionnaire to investigate other factors that might be responsible. Only two of the four women filled out the survey, however.

Gerald Caplan, coordinator of the Advocacy Unit of the Public Health Department, told Brooks that he considered the survey "quite unsatisfactory" and urged the *Star* to conduct a broader epidemiological survey that would include all *Star* employees.

The Southern Ontario Newspaper Guild welcomed the Health Department's concern. The Guild is still not convinced that no radiation hazard exists. It has set up its own ophthalmological study of VDT operators and intends to "continue demanding testing for and monitoring of radiation as a right of all VDT users," according to John Bryant, executive officer of the Guild.

### Toronto Cataract Case

An Ontario government employee has filed a claim with the Workmen's Compensation Board seeking compensation for cataracts, which she believes were caused by radiation from VDTs. Ms. Darlene Weiss's case is the first of its type before the Board.

Weiss, who is 40, said she first noticed problems with her vision while using VDTs at the Ministry of Transportation and Communications. An eye examination taken before she began her job at the Ministry did not indicate any abnormalities. Now, according to the Ontario Public Service Employees Union (OPSEU), Weiss has cataracts that must be surgically removed. She worked on terminals for 19 months, beginning in August 1978.

Dr. Milton Zaret, a well known ophthalmologist specializing in non-ionizing radiation effects, examined Weiss and is convinced her cataracts are radiation-induced.

The Ministry of Labor's occupational health and safety division must check the VDTs Weiss worked on before a decision from the Board can be reached. (One of these terminals was lost after its return to Bell Canada for checks, but it has since been found.)

According to Robert DeMatteo, occupational health and safety coordinator for the union, the Provincial government does not have the equipment to take detailed radiation measurements OPSEU thinks are necessary. Therefore, the union is hiring a private contractor to perform

(continued p. 4)

comprehensive tests on the Viewcom 3 and the three Sycor terminals Weiss used at the Ministry.

The union has also commissioned Zaret to design a questionnaire for its members who work on VDTs. This survey should get underway in mid-March.

### Rashes

Reports from Europe are linking facial rashes to VDT use. Dr. H.H. Tjønn of the Norwegian Directorate of Labor Inspectorate in Oslo has verified that 16 cases of rash among VDT operators during 1979 and 1980 were related to the work environment.

According to Tjønn, Dr. Walther Cate Olsen at the Christian Michelsens Institute in Bergen, Norway, is researching the possible role of static electricity and airborne dust in causing the skin reaction. All of the reported cases occurred during the winter in workplaces with low relative humidity and synthetic fiber carpets, factors that helped produce high measured levels of static electricity.

Radiation from the units was among the factors checked and ruled out as possible causes.

The rash symptoms are itching followed by redness on the cheeks, and sometimes the chin and forehead. Redness appears at the office, and usually disappears a few hours after work.

Four similar cases at one English office were observed by Drs. R.J.G. Rycroft and C.D. Calnan, from St. John's Hospital for Diseases of the Skin in London.

The Norwegian and English reports were presented at the Loughborough University Conference on VDTs last December.

Meanwhile, across the Atlantic, twelve cases of facial rashes among VDT operators have been reported to the Ontario Public Service Employees Union in the past 18 months. Robert DeMatteo, at the Union, says the Ministry of Labor does not think these complaints require radiation check of the VDTs in question.

The cause of this unusual problem remains undiagnosed.

### Government Assurances

US and Canadian government officials assert there is no radiation hazard from VDTs. Commenting on the Weiss case and the *Toronto Star* incident, M.H. Repacholi, head of the non-ionizing radiation section in Ottawa, stated, "I cannot conceive of cataracts or birth defects coming from VDTs." David Conover of NIOSH's Physical Agents Branch in Cincinnati also argues there is nothing to worry about. He stressed that there is little field-body coupling and little absorption at 15-20 kHz, the frequencies most often emitted from VDTs.

## BRIEFS

The long awaited NIOSH Bay Area VDT study will go to the printers soon. Copies of the report have been sent to the participating companies and unions...the Bureau of Radiological Health (BRH) is putting the final touches on its study, *An Evaluation of Radiation Emissions from Video Display Terminals*. The report of BRH's investigation of ultrasound, RF, microwave, X-ray and light emissions is due out by April... This month, Dr. Steven Sauter at the University of Wisconsin Department of Preventative Medicine and Wisconsin State officials are discussing possible State action on VDTs. Sauter may assist the State in designing a training program for public employees in proper VDT use and in developing a design standard for terminals used by the State... The Cold Type Organizing Committee has written a pamphlet, *Don't Sit Too Close to the TV: VDTs/CRTs and Radiation*. Copies are available for \$1, or \$1.50 by mail from the Committee at P.O. Box 40, Jerome Avenue Station, Bronx, NY, 10468... Visual fatigue and VDTs will be the focus of a session at the 1981 American Industrial Hygiene Conference, May 24-29 in Portland, Oregon.

James H. Stebbings, Jr. Sc.D., has been selected as the tenth member of the Scientific Advisory Panel for the New York State Overhead Power Lines Project. Stebbings is an Associate Professor at the University of Minnesota School of Public Health.

Final approval of the Panel, which will oversee and evaluate a five year study on the health effects of electromagnetic radiation from the lines, is expected soon.

The Bioelectrical Repair and Growth Society announced its formation "as a result of the burgeoning interest around the world in electrical mediation of biological repair and growth." The current president is Dr. Carl T. Brighton, while Dr. Joseph Watson is president-elect pro tem. (See conference calendar for address.)

The Georgia Institute of Technology is seeking a new director for its Electromagnetics Laboratory at the Engineering Experiment Station. The laboratory has 65 research professionals studying such areas as millimeter/submillimeter wave technology; microwave solid-state technology; infrared/electro-optical systems; remote sensing, and physical sciences. All inquiries to D.W. Robertson, principal research engineer, Engineering Experiment Station, Georgia Institute of Technology, Atlanta, GA 30332.

History Professor Nicholas H. Steneck of the University of Michigan, Ann Arbor, is continuing his work on the development of microwave radiation safety standards. Steneck's chronicle of events up to 1960 was published last summer: "The Origin of US Safety Standards for Microwave Radiation," *Science*, 208, 1230, 13 June 1980, and "Early Research on the Biological Effects of Microwave Radiation: 1940-1960," *Annals of Science*, 37, 323, 1980. Funded by a National Science Foundation grant, Steneck will be bringing the microwave history up to the present.

Steneck would like to hear from anyone who can help him reconstruct the events leading to the microwave standard: Professor Nicholas Steneck, Department of History, University of Michigan, Ann Arbor, MI 48109. (313) 763-2230.

Four researchers have joined the US Environmental Protection Agency's Experimental Biology Division at Research Triangle Park in North Carolina. They are: Dr. James A. Rabinowitz, a research physicist in the cellular biophysics branch, where he will study the interaction of microwaves with molecular systems. Dr. Ronald J. Spiegel, an electronics engineer in the bioengineering branch, whose studies center around the development and verification of numerical models to predict induced power densities and the thermal response to exposure to electromagnetic fields. Dr. Christopher J. Gordon, a physiologist in the developmental biology branch, who is interested in the effects of microwaves on the temperature regulation in test animals. And Dr. William P. Watkinson, also a physiologist in the developmental biology branch, who will be working on the cardiovascular effects of environmental agents on laboratory animals.

## AGENCIES

The implications of the Reagan budget cuts for radiation programs are still unclear. As of the end of February, rumors were rampant in the Capitol, but federal agency officials were unwilling to speak "on the record" about the extent and impact of the cuts. *Microwave News* will have a complete report next month.

### Bureau of Radiological Health

BRH has granted the Finessa Corporation of Threvos, Pennsylvania a variance from the microwave oven performance standard for the Microwave Tunneloven, model 7800-03/15 manufactured by Kreis AG in Switzerland. (46 *Federal Register* 7444, January 23, 1981) The variance is effective for two years. The oven has a conveyor belt and can heat food on a continuous basis. Its main use is intended to be in hospital and hotel kitchens to reconstitute chilled food. The unit may also be used as an industrial heater for grain and cereal products.

The variance was granted under the conditions that permanent warning labels be attached to the oven, that the oven have three safety interlock switches on two different circuits, that there be microwave-absorbing material in both entry and exit

channels and that the user and service manuals contain appropriate cautionary instructions.

### Federal Trade Commission

The final FTC order requiring Litton Industries to stop making unsubstantiated claims about its microwave ovens, and forcing it to keep accurate records of any tests and surveys on oven performance used in such claims, has been published in the *Federal Register* (46 *FR* 8445, January 27, 1981). See *Microwave News*, February 1981.

### National Cancer Institute

NCI has issued a request for proposals (RFP: NCI-CM-17480) to assess the performance of at least two heat generating and at least two thermometry systems. At least three patients with tumors in each of the major anatomic sites (e.g. brain, neck and head, lung, deep lymph nodes, etc.) must be treated with each system, and the temperature measured at multiple locations. A detailed analysis will be required, as well as the development of guidelines for the use of the equipment. Copies of the RFP may be obtained by submitting a request, in writing, to: Harold Thiessen II, Treatment Contracts Section, Research Contracts Branch, NCI, Room 228, Silver Spring, MD 20910.

## RARE BLOOD DISORDER *(continued from p. 1)*

cythemia was not linked as a co-existing condition in the death certificates. Silverman had also looked through the Moscow epidemiology and found only one case of polycythemia; the case involved an individual who had not been exposed to microwaves.

Silverman warned that the reason her epidemiology had not picked up an increase in polycythemia may be that only a limited amount of morbidity data was collected for discharged Naval personnel. Her study would have picked up only those veterans who were treated in Navy or VA hospitals or who had service connected disabilities. Thus, a more extensive follow-up would be needed to indicate the presence or absence of such a rare disease.

In a telephone interview, Dr. Friedman said that he had originally met with considerable opposition to the publication of these findings; "The military was quite concerned—many people thought that it was premature to publish such unsubstantiated findings." Indeed, the Army had pointed to the negative data in the radar epidemiology as grounds for withholding publication.

After numerous written appeals, Friedman's Commander approved the letter. Friedman said that he had received considerable support from Captain Paul Tyler, director of the Armed Forces Radiobiology Research Institute, and Colonel Lawrence Larsen of the Walter Reed Army Institute of Research.

Friedman is planning to pursue his research on polycythemia by asking the patients to complete a questionnaire. He is especially interested in gaining information about microwave exposures. In order to protect his study against spurious symptoms suggested by microwave exposure, Friedman plans to confine his review to physical findings.

In his letter, Friedman noted that his patient population included many microwave exposed workers from the US Army

Defense Center and the White Sands Missile Range.

Next month, Friedman is going overseas for more training and will return at the end of May.

On learning of the letter, Dr. Arthur Frank, an epidemiologist at the Mount Sinai School of Medicine, advised that the new results should be evaluated by doing complete blood counts on a large number of microwave exposed workers.

Harrison's *Principles of Internal Medicine* (seventh edition) describes polycythemia rubra vera, that is the type of polycythemia that does not develop in response to a known stimulus as a "disease of unknown cause, insidious onset, and chronic course. It is characterized by a striking absolute increase in the quantity of circulating red corpuscles and usually also by evidence of increased production of myeloid leukocytes and platelets." The symptoms are described as, in part:

The onset is insidious and the progress gradual. Headache, dizziness, ringing in the ears, or visual disturbances; dyspnea lassitude, or weakness; skin or mucous membrane hemorrhages; pruritis, especially after a hot shower or bath; a sense of weight in the abdomen because of the enlarged spleen; or irritability, depression, forgetfulness, or vague symptoms suggesting neurasthenia are complaints which may be encountered in many patients. Various gastrointestinal symptoms, such as fullness, belching, or constipation may be present, or symptoms of peptic ulcer may be found. Sometimes the symptoms are those attributable to increased metabolism: lassitude, increased sweating, and loss of weight. Swelling and pain in the extremities may be very troublesome. However, in still other patients the symptoms are so insignificant that the polycythemia is discovered only accidentally.

The face is a deep red rather than truly cyanotic.... The blood pressure is more often normal than elevated. Enlargement of the liver is frequent, and sponemegaly is found in at least 75 percent of cases.

# AT THE WORLD TRADE CENTER

## Confusion and Controversy in New York City

The new broadcast antennas atop the World Trade Center (WTC) in New York City continue to radiate confusion and controversy.

The twin 110-floor towers of the WTC—owned and operated by the Port Authority of New York and New Jersey (PA)—will eventually house most of the TV and FM stations in the New York metropolitan area, as well as many other specialized transmitters. Relocation of broadcast facilities from the Empire State Building—where the bulk of them have been until now—downtown to the \$20 million master antenna at the WTC has touched off disputes about radiation levels near the antennas, and the radiation safety standards that should apply to them.

The shrinking TV broadcast range and loss of reception that followed the move, combined with citizen apprehension over microwaves, have produced an anxious situation for the broadcasters and the public alike. To a point, the PA is caught in the middle as the reluctant landlord.

### Radiation Measurements

The only WTC radiation measurements now available were taken by Richard Tell, of the Environmental Protection Agency (EPA), during the early morning hours of July 16, 1980, and released to *Microwave News* in late January. At that time, two VHF TV stations (WCBS-2 and WNEW-5) and two UHF stations (WXTV-41 and WNJU-47) were broadcasting from the

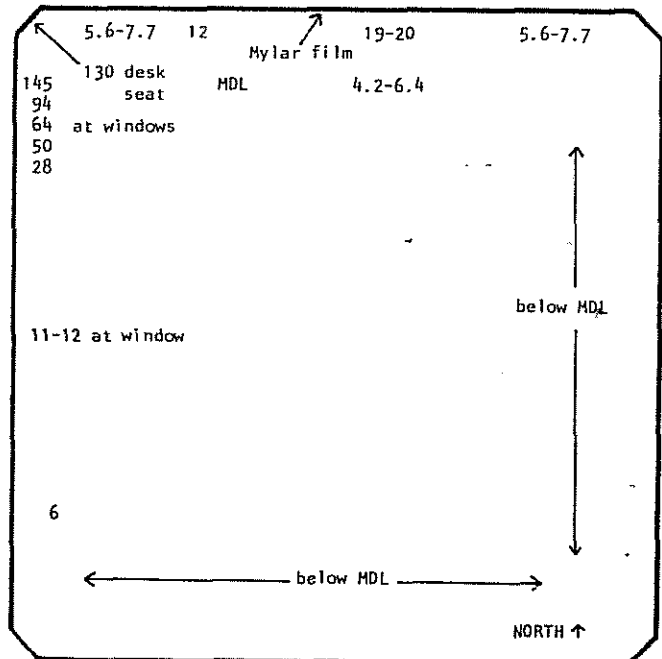
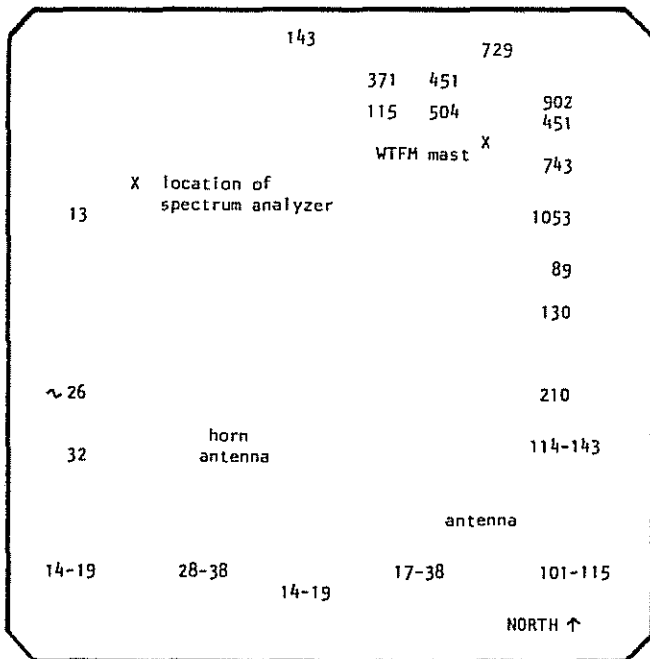
master antenna on the north tower; one TV translator (W60A1) and one FM station (WTFM) were broadcasting from the south tower. (Since then, WABC-7, located on the master antenna, the main mast, has been turned on.) Tell took a series of readings with a broadband Holaday meter (HI-3001) on the public observation deck on the roof and on the 107th floor observatory of the south tower. Due to high winds, Tell could make only one set of roof measurements of the individual station signals with a spectrum analyzer.

The maximum reading on the roof was 1053  $\mu\text{W}/\text{cm}^2$ , due largely, according to Tell, to WTFM. Exposures below on the 107th floor fell in the 6-17  $\mu\text{W}/\text{cm}^2$  range generally, but peaked as high as 145  $\mu\text{W}/\text{cm}^2$  near the windows. A level of 130  $\mu\text{W}/\text{cm}^2$  was identified at a desk in the far northwest corner. (See accompanying diagrams for full set of measurements.) No readings were taken on the north tower, home of the main antenna.

Before and after the EPA survey, the PA's consultant, Robert Silliman, of Silliman and Silliman in Washington DC, took detailed measurements. They have not been released. Some of the numbers did reach the New York papers last February ("Making (Micro)waves over Trade Center TV," *Daily News*, February 25, 1980, and "Microwave Threat Stalls Trade Center TV Tower," *New York Times*, February 26, 1980). The resulting commotion prompted the PA to install mylar reflecting material on some windows in the northwest corner of the south tower. The mylar was already in place by the time Tell arrived. Though Silliman's numbers are still confidential, The PA maintains that they are significantly lower than Tell's EPA measurements.

Joyce Feldman, EPA's radiation representative in New York,

Broadband power densities ( $\mu\text{W}/\text{cm}^2$ ) measured by EPA's Tell on the south tower roof (left), and the 107th floor observatory (right). All dimensions are approximate. (MDL = Minimum Detectable Level)



explains that a report on the Tell measurements has not been issued because they are now out-of-date. After Tell's visit, the PA installed a protective shield, known as a wagonwheel, on the WTFM mast on the south tower. The wagonwheel has changed the radiation patterns on the towers.

### Contradictory Results

At a February meeting, PA officials, including Franklin Bass from the general counsel's office, Joseph Milano, manager of telecommunications and information systems, and Thomas Sorensen, broadcast coordinator, told *Micro wave News* that the Tell numbers were "wrong" and "unreliable." In a yet to be released letter, Silliman had written the PA arguing that Tell's readings were really peak values, which had to be divided by an empirically derived factor of 1.54. The 1.54 factor was required because Tell, according to Silliman, had used the "peak hold" button on the Holaday meter when taking his readings. Silliman also wrote that any measurements of TV signals had to be further corrected to discount for synchronization pulses.

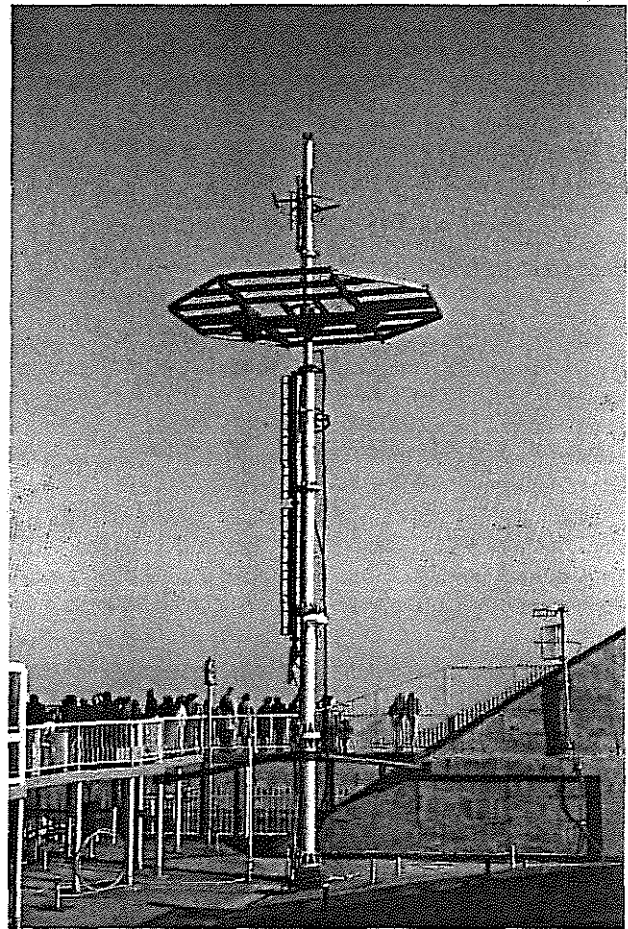
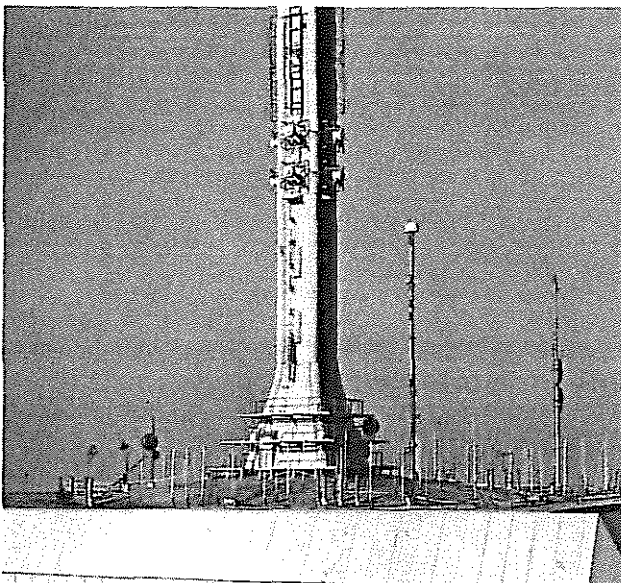
Speaking from his office in Las Vegas, Tell denied using the peak hold button. And Reed Holaday, president of Holaday Industries in Eden Prairie, Minnesota, said that his 3001 meter does not respond to TV "synch pulses."

On hearing about Tell's and Holaday's responses, Silliman withdrew his 1.54 conversion factor, and said, "There is some doubt that my point [about the meter] is valid."

The PA and Silliman now explain the differences between the two reports by the method each used to take measurements. Tell surveyed a number of small areas and identified local maxima while Silliman took his readings at specific locations along a pre-determined grid.

EPA's Feldman offered the same explanation. But no one

*The base of the master antenna on the north tower.*



*Station WTFM mast with "wagonwheel" protective shield on the south tower. Behind, tourists enjoy New York views.*

outside the PA—including EPA—has yet seen the Silliman reports. Asked about all the confusion over the radiation levels, Feldman said that in the absence of federal standards, she had no legal authority to intervene, and that communication problems arose when so many people were involved in such an informal way.

The wagonwheel shield, installed to reduce WTFM radiation, had an unanticipated result. Signals from WKCR, an FM station originally located on the same mast under WTFM, were reflected downward by the wagonwheel. Silliman said that while local peaks had changed, the general radiation levels were about the same. WKCR-FM is not now operating from the WTC. The PA stressed that, before WKCR begins broadcasting, it will be moved to another antenna.

The PA claims to have spent more than \$50,000 on monitoring—or a total of \$200,000 when corrective action is included. Future PA surveys are planned, but no firm dates have been set.

At the end of his report, Tell recommended that a "more exhaustive field survey be accomplished to determine the absolute contribution of fields from the various broadcast frequencies."

*(continued p. 8)*

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## AT THE WORLD TRADE CENTER

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*(continued from p. 7)*

He also advised: "a survey of field levels inside the offices of several top floors would be worthwhile." Tell said that he could not predict if, or when, he would be able to return to the WTC to do such follow-up surveys for EPA. Federal travel budgets have been slashed, and he could not come to New York before the next fiscal year. If he does return, he wants to take a detailed set of measurements over the course of several days.

### Safety Standards

The PA has consistently maintained that it will meet a 100  $\mu\text{W}/\text{cm}^2$  general population exposure standard. This level, set for the PA by Dr. Paul Tyler, director of the Armed Forces Radiobiology Research Institute in Bethesda, Maryland, is purely voluntary. The EPA has not issued any guidance for public exposures to non-ionizing radiation.

At a New York State Senate committee hearing, held last summer at the WTC, Patrick Falvey, general counsel and assistant executive director of the PA, testified that the PA "has undertaken a moratorium wherein no new broadcasting will be permitted from the [WTC] unless it can meet this strict standard."

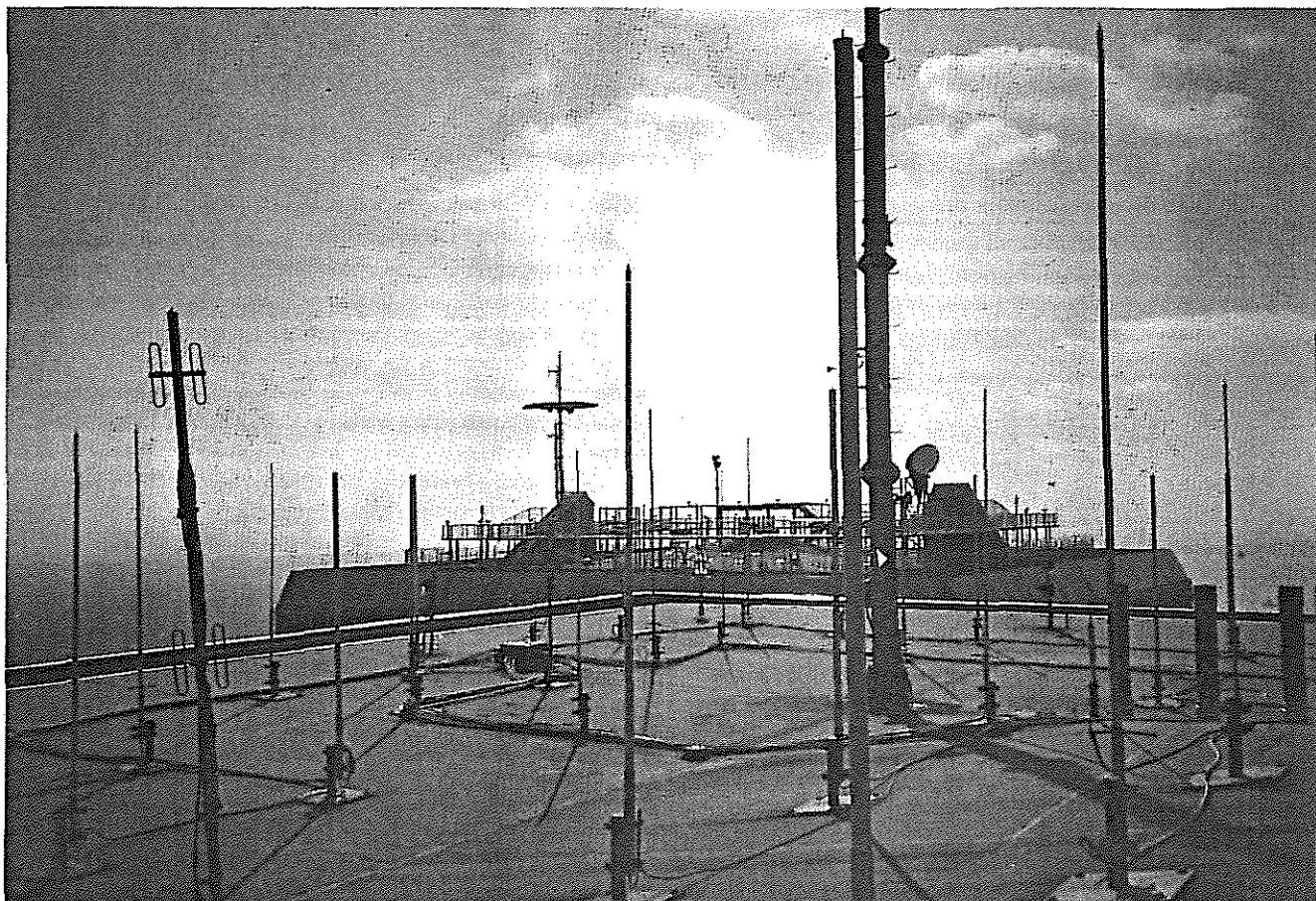
The PA's safety standard is twice as high as the 50  $\text{mW}/\text{cm}^2$  level proposed by Dr. Leonard Solon, the director of the City's Bureau for Radiation Control. The broadcasters, on the other hand, feel that the PA standard is far too stringent. Otis Freeman of WPIX, and a member of the TV Broadcasters All Industry Committee—an organization of New York City's TV stations—says "100 is much too low." In Freeman's view, such a standard would interfere with the TV industry, disrupting the City's—and if applied generally, the nation's—communications system.

Attempting to meet its standard, the PA has kept the UHF stations (41 and 47) operating at only 50 percent power, and has turned away many other potential clients. Bass, the PA attorney, complained of losing a lot of money from unrented space as a result. He added that one of the UHF stations was lobbying the State legislature to force the PA into letting them turn up the power. Some, tired of the delays, are threatening to sue the PA for breach of contract.

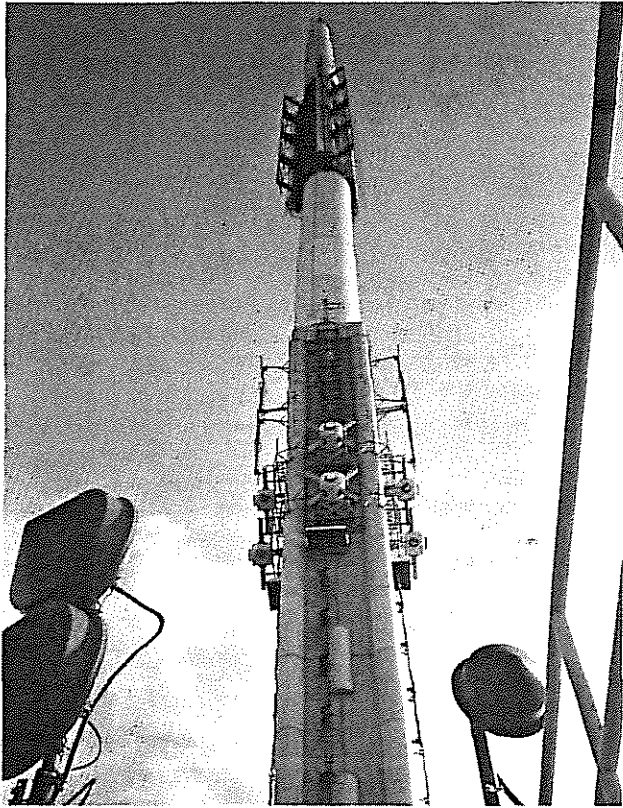
In some ways the PA is a reluctant landlord. It agreed to house the antenna in 1967, but only after public reaction to TV interference that could have been caused by the WTC threatened to block the towers' construction. The PA wound up having

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*The south tower from the base of the master antenna on the north tower. In the foreground, various specialized communications antennas.*







Master antenna on the north tower, flanked by receiving antennas.

to pay for moving the antenna downtown to the Empire State Building. As the WTC neared completion, however, the PA sought a review of its commitment. It was rejected by the Federal Communications Commission.

Two more TV stations (WOR-9 and WPIX-11) plan to move into the WTC by late March, and two more (WNBC-4 and WNET-13) by Labor Day. The dates for moving the five FM stations (WNYC, WPIX, WNEW, and WPAT) onto the master antenna have yet to be announced. WKCR will not go on the air until it is moved to another antenna, being built for the Coast Guard by Motorola.

#### TV Reception

The stricter the safety standard, the lower the broadcast power and hence the smaller the audience that can be reached. Ironically, stations threatened with losing their outlying markets due to weak signals also face troubles close to the antenna. As TV stations move to the WTC, viewer complaints follow. When WCBS moved, it began to receive 100 calls a day; people grumbled about fuzzy reception, ghosts, and poor color. Jim Baker, chief engineer at WABC, reports that his station heard from some 2000 disgruntled customers. WABC has since distributed 7500 pamphlets, "How to Improve Television Reception on Channel 7."

Part of the problem is that viewer antennas are still pointed towards the Empire State Building. Freeman of WPIX said that the biggest mistake was moving the stations piecemeal: They should have all gone to the WTC at the same time.

#### Local Apprehension

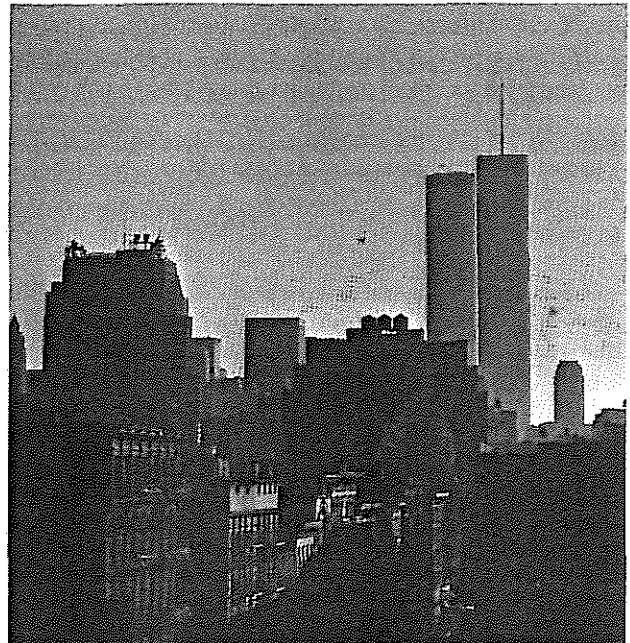
Meanwhile, residents living in neighborhoods near the WTC are worried about the potential threat of microwave radiation. On January 29, Community Board No. 1 in lower Manhattan sponsored a briefing session on microwaves. Some eighty residents heard the EPA's Feldman and a representative of Solon's Bureau for Radiation Control explain that the radiation levels emitted by the WTC antennas were very low. But one reaction from the audience summed up the prevailing attitude: "Do we have cause for concern or not? That is why we came here, the numbers don't mean anything to us."

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This article very nearly became academic. According to news stories released February 26, an Argentinian Boeing 707 jet, with 58 people aboard, just missed crashing into the WTC mast last February 20. The jet was less than a minute and a half away from the bottom of the 350 foot mast (each of the towers is 1350 feet high), when an air traffic controller ordered it to turn and climb out of danger.

As we go to press, the PA has agreed to release the Silliman data to Microwave News. They will be featured in the April issue.

The World Trade Center, as seen looking south from lower Manhattan.



# CONFERENCES

## PROCEEDINGS

### Now Available:

*Thermal Characteristics of Tumors: Applications in Detection and Treatment.* papers presented at a conference at the New York Academy of Sciences, March 14-16, 1979. Edited by Rakesh K. Jain and Pietro M. Gullino. *Annals of the New York Academy of Sciences*, 335, 1980.

*The Mechanisms of Microwave Biological Effects.* a report of a workshop held at the University of Maryland, College Park, Maryland, May 14-16, 1979. Edited by Leonard S. Taylor and Augustine Y. Cheung. Available free from the Office of Naval Research, Code 441, Arlington, VA 22217; enclose a self-addressed label.

*Direct Broadcast Satellite Communications.* a symposium conducted by the Board on Telecommunications-Computer Applications and the Space Applications Board on April 8, 1980. Available from the Space Applications Board, National Research Council, 2101 Constitution Avenue, NW, Washington DC 20418.

*Health Hazards of VDUs? I.* a conference held on December 11, 1980. Available for £5 from the HUSAT Research Group, Department of Human Sciences, Loughborough University of Technology, The Elms, Elms Grove, Loughborough, Leics. LE 11 1RG, England.

## CALENDAR

- April 13-15: Annual Conference and Trade Show of the International Association of Satellite Users, Washington Hilton Hotel, Washington DC. Contact: A. Fred Dassler, IASU, 6845 Elm Street, Suite 710, McLean, VA 22101.
- May 31-June 4: 29th Annual Scientific Meeting of the Radiation Research Society, Hyatt Regency Hotel, Minneapolis, MN. Contact: Office of the Executive Director of the Society, 4720 Montgomery Lane, #506, Bethesda, MD 20014.
- June 9-12: 16th Annual Symposium of the International Microwave Power Institute, Royal York Hotel, Toronto, Canada. Contact: IMPI, 211 East 43rd Street, New York, NY 10017.
- June 15-19: IEEE and URSI Symposium, Bonaventure Hotel, Los Angeles, CA. Sponsored by the Antenna and Propagation Society and the Microwave Theory and Techniques Society of the IEEE and four Commissions of URSI. Contact: IEEE, 245 East 47th Street, New York, NY 10017.
- June 27-July 2: 6th International Symposium on Bioelectrochemistry and Bioenergetics and 1st Meeting of the International Bioelectrochemical Society, Kibbutz Kiryat Anavim, Israel.

Contact: Mrs. R. Goldstein, Secretary, Bioelectrochemistry Symposium, The Aharon Katzir-Katchalsky Center, The Weizmann Institute of Science, Rehovot, Israel.

- June 30-July 4: International Symposium on Biomedical Thermology, Palais de la Musique et des Congres, Strasbourg, France. Includes sessions on hyperthermia in cancer treatment (July 3) and bioelectromagnetics (July 1). Simultaneous translation in English, French, and German. Contact: Dr. M. Gautherie, Laboratoire de Thermologie Biomedicale, Faculte de Medicine, Universite Louis Pasteur, 11 rue Humann, 67085 Strasbourg, France.

- July 13-16: 10th L.H. Gray Conference: The Biological Action of Radiofrequency, Microwave, and Ultrasonic Radiations, Oxford England. Contact: Dr. G.R. ter Haar, Physics Division, F Block, Institute of Cancer Research, Clifton Avenue, Sutton, Surrey SM2 5PX, England.

- August 10-12: 3rd Annual Bioelectromagnetics Society Meeting, Washington DC. Contact: BEMS, P.O. Box 3651, Arlington, VA 22203.

- August 10-19: 20th General Assembly of the International Union of Radio Science (URSI), Hyatt Regency Hotel, Washington DC. Includes a series on "Interaction of Electromagnetic Waves with Biological Systems," on August 13-14, chaired by Professor Saul Rosenthal of Polytechnic Institute of New York, and an "Open Symposium on Millimeter and Submillimeter Waves." Contact: Mr. Richard Y. Dow, Organizing Committee of URSI General Assembly, National Academy of Sciences, 2101 Constitution Avenue, NW, Washington DC 20418.

- August 19-21: 3rd Annual Satellite Communications Users Conference, Regency Hotel, Denver, CO. Contact: SCUC '81, Satellite Communications Magazine, 3900 S. Wadsworth Blvd, Denver, CO 80235.

- September 7-11: 11th European Microwave Conference, Amsterdam, The Netherlands. Contact: Microwave Exhibitions & Publishers Ltd., Temple House, 36 High Street, Sevenoaks, Kent TN13 1JG, England.

- November 9-11: 1st Annual Meeting of the Bioelectrical Repair and Growth Society, Philadelphia, PA. Contact: Executive Secretary of the Society, 425 Medical Education Building, #36th and Hamilton Walk, Philadelphia, PA 19104.

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