

BIBLIOGRAPHY OF REPORTED BIOLOGICAL PHENOMENA  
( 'EFFECTS' ) AND CLINICAL MANIFESTATIONS ATTRIBUTED TO  
MICROWAVE AND RADIO-FREQUENCY RADIATION

Ninth Supplement  
to  
Bibliography of Microwave and RF Biologic Effects

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## PREFACE

(REPRINTED FROM THE SEVENTH SUPPLEMENT)

It is the hope of the author that the updating of this Bibliography will continue to provide guidance to the diffuse and often conflicting literature on the biological responses to electromagnetic radiation (EMR) at radio and microwave-frequencies, with particular reference to the effects of concern to humans. Such guidance is needed in the formulation and appraisal of criteria and limits of human exposure to "non-ionizing" electromagnetic radiation (EMR), and in the planning and conduct of future research.

My original plans for the Bibliography were to categorize and key the literature citations to the "outline of biological and clinical effects" (Chapter 1 of the initial report). This proved to be a much more difficult and time-consuming task than anticipated, and was actually completed at the time for only 400 papers. Since then, a much more extensive classification of the literature has been accomplished, using Keysort cards punched on the four axes to indicate: the research area, organ system, frequency, power level, species used, experimental data, and a summary of the results. This will be the subject of a future report.

The standard format used throughout the Bibliography is: author, (date), journal, volume, (issue): page, "title". The citations are alphabetized by author, and in chronological order. Multiple authored articles are also alphabetically ordered according to the second, third, etc., author. Inclusive pagination is given where possible, as is the original language of the citation. Report accession and translation numbers (some of the sources were listed in Appendix A of the initial report), and alternate sources are listed when known. The title of books is underlined. When the title of the report was not available (or not given), a short (one line) description of the paper is listed whenever possible. Reports in which the name of the author was not given are listed chronologically using the format, "title", reference, source, (date). In many cases the citation was obtained from secondary (and tertiary) sources. For this reason it was impossible to put every citation into a consistent format.

The original intent for the Bibliography was to limit the citations to those papers describing bio-effect studies using electromagnetic radiation at radio- and microwave-frequencies. Some broadening of scope has occurred, so that this Supplement includes a few references to recently issued relevant reports on biological studies involving pure electric or magnetic fields (alternating or static), extremely low frequency (ELF) fields, and a citation to ultrasound (which, although it is not electromagnetic radiation, is in some respects similar to RF radiation). Other citations include such topics as bio-medical studies using electromagnetic pulse radiation (EMP), high voltage (Kirilian) photography, biological dosimetry, effects of EMR on implanted electronic cardiac pacemakers, some therapeutic applications of EMR (including wound healing and bone regeneration), microwave exposure limits, regulations and standards, and such diverse applications as tissue fixation, insect control, and electroanesthesia.

The use of square brackets for explanatory notes and comments has been increased. The listing of relevant presentations made at technical meetings (especially in view of the sometimes considerable time lag before the paper appears in print) has been expanded.

The author continues to solicit comments and criticism regarding form, content, omissions, etc., as well as information on new papers/manuscripts so that updating, revision, and corrections can be made.

## ABSTRACT

Approximately 575 additional references on the biological responses to radio frequency (RF) and microwave radiation, published up to September 1977, are included in this continuing bibliography of the world literature. This Supplement brings to more than 4600 the number of listed references. Particular attention has been paid to the effects on humans of non-ionizing radiation at RF and microwave frequencies. The citations are arranged alphabetically by author (where possible), and contain as much information as possible so as to assure effective retrieval of the original documents. Soviet and East European literature is included in detail.

This report is the ninth supplementary "up-dated" bibliographic listing to Naval Medical Research Institute (NMRI, Bethesda, Maryland, 20014) Research Report No. 2, completed under Research Work Unit MF12.524.015-0004B, October 1971, by the senior author and available from the National Technical Information Service (NTIS, Springfield, Virginia, 22151). See Appendix I.

Considerable interest has been expressed for the continuation of this bibliographic series. That, coupled with the NIOSH plans to prepare a criteria document concerned with occupational exposure to radio frequency and microwave radiation, strengthened our commitment to continue to prepare these bibliographic supplements.

Relevant presentations (and, as yet, unpublished) made at technical meetings are included in a separate section of this Supplement. Another section contains unsigned reports and articles arranged in chronologic order.

Listed in an appendix to this Supplement is a chronology of the previous supplements (and the addenda and revisions), the Navy office issuing the report, the date of appearance of the report, the inclusive citation numbers, and the order number (AD number) by which the report is obtainable from NTIS.

In September 1976, an alphabetical Compilation and Integration of the first 3725 references was prepared. These citations consisted of the original bibliography and the first seven supplements, plus the alphabetical addenda (appended to the original bibliography). The "outline of the bio-effects" which appeared in the original bibliography was also included as an appendix.



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SUPPLEMENT NUMBER 9: UNSIGNED REPORTS AND ARTICLES

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Sciences, reported this month that the electric and magnetic fields to be generated by SEAFARER's massive underground network of electrically energized cables probably will have no ill effect on health and environment. The report is a preliminary one, however. The NRC will issue its final report next spring. The preliminary document said in part "...The evidence evaluated so far indicates that at SEAFARER frequencies such weak-field effects should not be cause for concern". Ocean Science News 18(52):2-3, (1976).

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4602. "Direct-contact diathermy probes found safer [to patient and operator]," Microwaves, 16(5):12 only (May, 1977).

4603. "Navy makes first test of Poseidon ELF radio" (SEAFARER Program), Navy Times, 26(17):28 only (Feb. 7, 1977).

4604. "Hardship Post. The State Department has declared Moscow an 'unhealthful post', and U.S. employees who are stationed there receive 20% more in salary as hardship allowance...based upon the State Department's evaluation of reported environmental conditions regarding sanitation and disease, medical and hospital facilities and climate. According to U.S. Embassy officials, one factor in determining Moscow as 'unhealthful' is the prevalence of giardiasis, a rare intestinal disorder that is believed to be spread in drinking water. Nothing has been said of the persistent microwave radiation of the Embassy by the KBG (the Soviet security and espionage apparatus)". Parade Magazine, The Washington (DC) Post (newspaper), p. 23 only, Jan. 9, 1977.

4605. "Nonionizing radiation hazards market", Rept. by Andy Hish Assoc., (9710 Cozycroft Avenue, Chatsworth, CA), (with sections on "Federal R&D programs on biomedical research, and microwave effects on humans"), 197?.

SUPPLEMENT NUMBER 9: TECHNICAL MEETING SECTION

4606. The 4th Annual Health Physics Society Midyear Topical Symposium "Electronic product radiation and the health physicist," Louisville, KY, January 28-30, 1970.

- I. New Scope for Health Physics
  - A. Energy Pollution of the Environment--MORGAN, K.Z. (Health Physics Div., Oak Ridge National Laboratories)
  - B. The Impact of Public Law 90-602--ELDER, R.L. (Bureau of Radiological Health, Environmental Control Administration)
  - C. Educational Needs to Implement New Responsibilities in Radiation Safety--STANNARD, J.C. (U. of Rochester Medical Center)
- II. Microwave and RF Radiation
  - A. Microwave Systems--
  - B. Instrumentation and Dosimetry--PALMISANO, W.A. (U.S. Army Environmental Hygiene Agency)
  - C. Biological Effects--SHER, L.D. (U. of Pennsylvania)
  - D. Microwave Safety and Standards--THOMPSON, R.L. (Environmental Health, Cape Kennedy)
- III. Laser Radiation.

4607. Conference on Engineering in Medicine and Biology, sponsored by Alliance for Engineering in Medicine and Biology, held in New Orleans, LA, 20-24 Sept. 1975

PEDERSON, P.C. (Univ. of Utah, Salt Lake City), Johnson, C.C., DURNEY, D.H., & BRAGG, D.G., "Diagnostic application of microwave radiation."

4608. Nineteenth Navy Occupational Health Workshop, sponsored by Navy Environmental Health Center, held at Mills Hyatt House, Charleston, SC, 27 Sept. - 01 Oct. 1976 (relevant presentations).

General Session--Radiation

TYLER, P.E. (Navy Med. Res. & Dev. Command, Bethesda, MD), "Bio-effects of RF/microwaves."

KNIGHT, M.G. (Navy Environmental Health Ctr., Cincinnati, Ohio), "RF/microwave hazard analysis."

DEVINE, R.T. (Bureau of Med. & Surgery, Navy, Washington, DC), "Microwave ovens (hazard from)."

4609. "The Bicentennial Symposium," 1976 International Microwave Symposium/Exhibition, Cherry Hill, NJ, June 14-16. (Relevant Session); (An expansion of citation no. 4050, this Biblio.)

Session 23: Review and State-of-the-Art, "Biological Effects and Hazards of Microwave Radiation" (ROSENTHAL, S.W., chmn.):

GUY, A.W., (Univ. of Washington, Seattle), "Biological Effects and Experimental Techniques," (invited)

JUSTESEN, D.R. (V.A. Hospital, Kansas City, MO),  
"Behavioral and CNS Effects," (invited)

BAIRD, R. (Nat. Bureau of Standards, Boulder, CO),  
"Measurements and Dosimetry," (invited)

TYLER, P.E. (Naval Med. Res. & Dev. Command, Bethesda,  
MD), "Medical Surveillance," (invited)

THIEL, J. (Texas Dept. of Health Resources, Austin),  
"Effects Other Than Biological," (invited)

Panel Discussion

4610. 1976 International IEEE/AP-S Symposium and Internat. Union of Radio  
Science (USNC/URSI) Meeting, held at University of Massachusetts, Amherst,  
Oct. 11-15. (Relevant Presentations)

Session AB-1A: Auditory and Other Sensory Effects (HUNT, E., CHMN.)

ADRIAN, J.J. (Megatek Corp., San Diego, CA), "Low frequency  
hearing and seeing."

CHOU, C-K, GUY, A.W. (Univ. of Washington School of Medicine,  
Seattle), & GALAMBOS, R. (Univ. of California, San Diego),  
"Characteristics of microwave-induced cochlear microphonics."

FREY, A.H., & COREN, E. (Randomline, Inc., Huntingdon Valley,  
PA), "Holographic evaluation of hypothesized RF hearing  
mechanisms."

JOHNSON, R.B., LOVELY, R.H., BUY, A.W. (Univ. of Washington  
School of Medicine, Seattle), & GALAMBOS, R. (Univ. of  
California, San Diego), "Microwave control of behavior:  
An auditory phenomenon."

LEBOVITZ, R.M., & SEAMAN, R.L. (Univ. of Texas Health  
Science Center at Dallas), "Microwave hearing: The  
response of single auditory neurons in the cat to pulsed  
microwave radiation."

LIN, J.C. (Wayne State Univ., Detroit, MI), "Predicted  
frequency and threshold of microwave-induced auditory  
sensation."

Session AB-1B: Prompt Behavioral Effects (D'ANDREA, J.A., chmn.)

BERMANT, R.I. (Univ. of Kansas), & JUSTESEN, D.R. (Kansas  
Univ. School of Medicine & Kansas City Veterans  
Administration Hospital), "Pavlovian conditioning of  
microwave-induced hyperthermia."

HJERESSEN, D.L., PHILLIPS, R.D. (Battelle-Northwest, Richland, WA), & LOVELY, R.H. (Univ. of Washington, Seattle), "Perception and response to pulsed microwave radiation by rats."

MONOHAN, J.C. & HO, H.S. (Bureau of Radiological Health, FDA, USPHS, HEW, Rockville, MD), "Temperature dependence of microwave avoidance."

Session AB-2A: CNS Effects (LARSEN, J.E., chmn.)

ALBERT, E.N., GRAU, L., & KERNS, J. (George Washington Univ. Medical Center, Wash. DC), "Microwave effects on the blood-brain barrier of hamsters." (withdrawn)

CATRAVAS, G.N., TAKENAGA, J., KATZ, J.B., & ABBOTT, J.R. (Armed Forces Radiobiology Institute, Bethesda, MD), "Effects of low power density microwaves on macromolecular constituents of the brain of rats."

FREY, A.H., & GENDELMAN, S. (Randomline, Inc., Huntingdon Valley, PA), "Electromagnetic energy exposure effects on motor coordination or balance."

PHILLIPS, R.D., HJERESSEN, D.L., & SHELDON, R.L. (Battelle-Northwest, Richland, WA), "Audiogenic seizure sensitivity of mice after repeated exposures to 2.88 GHz pulsed microwaves."

SWITZER, W.G. (Trinity Univ., San Antonio, TX), & MITCHELL, D.S. (Southwest Research Institute, San Antonio, TX), "An electron microscopic and hematologic investigation of rats chronically exposed to low-intensity 2.45 GHz microwave radiation."

Session AB-2B: Immunologic and Hematopoietic Effects (ROMERO-SIERRA, C., and HAZZARD, D., co-chmn.)

HUANG, A.T., ENGLE, M.E., & ELDER, J.A. (Duke Univ. Medical Center & EPA), "Lymphocyte transformation induced by microwave radiation."

RAGAN, H.A., & PHILLIPS, R.D. (Battelle, Pacific Northwest Laboratories, Richland, WA), "Effects of pulsed microwaves on the hematopoietic system of mice."

WIKTOR-JEDRZEJCZAK, W., AHMED, A., CZERSKI, P., LEACH, W.M., & SELL, K.W. (Naval Medical Research Institute, Bethesda, MD & Bureau of Radiological Health, FDA, Rockville, MD), "Microwaves (2450 MHz) stimulate maturation of B lymphoid cells in spleens of exposed mice."

WIKTOR-JEDRZEJCZAK, W., AHMED, A., CZERSKI, P., LEACH, W.M.,

& SELL, K.W. (Naval Medical Research Institute, Bethesda, MD & Bureau of Radiological Health, FDA, Rockville, MD), "The effect of microwaves (2450 MHz) on the response of mice to T lymphoid cell dependent and T lymphoid cell independent antigens: Preliminary results."

Joint AP-S/URSI Session, Invited Papers: (FANTE, R.L., chmn.)  
(relevant papers)

VOSS, W.A.G. (Canada), Replaced by JUSTESEN, D.R. (Kansas City V.A. Hospital), "Biological effects of electromagnetic waves--A review of current research."

Session AB-3A: Dosimetry (HO, H.S., chmn.)

GANDHI, O.P. & SEDIGH, K. (Univ. of Utah, Salt Lake City)  
"Biological phantom materials for simulating man at different frequencies."

GURU, B.S., & CHEN, K.M. (Michigan State Univ., East Lansing), "Internal EM field and absorbed power density in human torsos induced by 1 to 500 MHz EM waves."

HERCHENROEDER, P., CHEUNG, A.Y. (Univ. of Maryland, College Park), SWICORD, M., & BASSEN, H. (Bureau of Radiological Health, FDA, Rockville, MD), "Microwave dosimetry via electric field mapping within full-size and scaled phantom models."

MASSOUDI, H., DURNEY, C.H., & JOHNSON, C.C. (Univ. of Utah, Salt Lake City), "Comparison of the average specific absorbed power in the ellipsoidal conductor and dielectric models of humans and monkeys at radio frequencies."

WALLACE, J.E., & GUY A.W. (Univ. of Washington School of Medicine, Seattle), "Experimental heating patterns in bi-layered biological tissue using circular aperture sources." (withdrawn)

Session AB-3B: Dosimetry (MITCHELL, J.C., chmn.)

ALLIS, J.W., BLACKMAN, C.F., FROMME, M.L., & BENANE, S.G. (U.S. Environmental Protection Agency, Research Triangle Park, NC), "Use of heating and cooling curves to measure microwave energy absorption in biological samples."

GANDHI, O.P., HUNT, E.L., & D'ANDREA, J. (Univ. of Utah, Salt Lake City & Walter Reed Army Institute of Research, DC), "Electromagnetic power deposition in man and animals with and without ground and reflector effects."

KINN, J.B. (U.S. Environmental Protection Agency, Research Triangle Park, NC), "Whole body dosimetry of small

animals: The effect of weight and exposure geometry."

PUTTHOFF, D.L., JUSTESEN, D.R., LEVINSON, D.M., WARD, L.B., & BLACK, J.A. (Univ. of Kansas School of Medicine & Kansas City Veterans Administration Hospital, Kansas City, MO), "Drug-induced ectothermia in small mammals: The quest for a biological dosimeter."

Session A-2: Dielectric Measurements (BIRNBAUM, G., chmn)

CARVER, K.R. (New Mexico State Univ., Las Cruces), "Dielectric sheet power spectral response and swept-frequency measurement applications."

JACOBI, J.H., & LARSEN, L.E. (Walter Reed Army Inst. of Research, Wash. DC), "Microwave interrogation of dielectric targets (II) by time delay spectrum."

LARSEN, L.E., & JACOBI, J.H. (Walter Reed Army Institute of Research, Wash. DC), "Microwave interrogation of dielectric targets (I) by scattering parameters."

MA, C.H., & DEATON, D. (Univ. of Mississippi), "Measurement of the dielectric constant and conductivity of biological materials by microwave cavity perturbation method."

ULABY, F.T., & ATTEMA, E.P.W. (Univ. of Kansas Center for Research, Inc., Lawrence, KS), "L-band measurements of the dielectric properties of saline soil using a power transfer technique."

Session AB-4A: Microwave Measurements and Exposure Systems (LIN, J.C., chmn)

CONOVER, D.L. (Nat. Inst. for Occupat. Safety & Health, Cincinnati, OH), "Industrial RF (6-40.68 MHz) personnel exposure problems--Initial observations."

HAGMANN, M.J., & GANDHI, O.P. (Univ. of Utah, Salt Lake City), "Radiators for microwave biological effects research--Waveguide slot array with constant radiation intensity."

HEYNICK, L.N., POLSON, P., & KARP, A. (Stanford Research Institute, Menlo Park, CA), "A microwave exposure system for primates."

JANES, D.E., TELL, R.A., ATHEY, T.W., & HANKIN, N.N. (U.S. Environmental Protection Agency, Silver Spring, MD), "Radiofrequency radiation levels in urban areas."

OLIVA, S.A., & CATRAVAS, G.N. (Armed Forces Radiobiology Research Institute, Bethesda, MD), "A multiple-animal

array for equal power density microwave irradiation."

Session AB-4B: Instrumentation--Probes (BOWMAN, R.R., chmn)

BABIJ, T.M., & TRZASKA, H. (Technical Univ. of Warsaw, Poland), "Omnidirectional Power density probes." (withdrawn)

BASSEN, H., HERCHENROEDER, P., CHEUNG, A., & NEUDER, S. (Bureau of Radiological Health, FDA & Univ. of Maryland), "Evaluation of an implantable electric field probe within finite, simulated tissues."

CETAS, T.C., HEFNER, D. (Univ. of Arizona College of Medicine, Tucson), SNEDAKER, C., & SWINDELL, W. (Univ. of Arizona, Tucson), "Further developments of the birefringent crystal optical thermometer."

LARSEN, L.E., MOORE, R.A., JACOBI, J.H., & HALGAS, F. (Walter Reed Army Institute of Research & Westinghouse Electric Corporation), "A microwave compatible temperature electrode."

TYAZHELOV, V.V., TIGRANIAN, R.E., & KHIZHNIAK, E.P. (Institute of Biological Physics, Acad. of Sci. USSR, Pushchino), "A new type of artifact-free electrodes for observing biopotentials in strong electromagnetic fields."

Session AB-5A: Physiological and Behavioral Effects (PHILLIPS, R., chmn)

GAGE, M.I. (U.S. Environmental Protection Agency, Research Triangle Park, NC), "Effects of single exposures to 2450 MHz microwave irradiation on rat behavior."

LU, S-T., LEBDA, N., MICHAELSON, S.M., PETTIT, S., & RIVERA, D., (School of Med. & Dent., Univ. of Rochester, NY), "Thermal and neuroendocrine effects of long term, low level microwave (2450 MHz, CW) irradiation."

MITCHELL, D.S., SWITZER, W.G., & BRONAUGH, E.L. (Southwest Research Institute, San Antonio, TX), "Effects of chronic athermal microwave radiation on innate and learned behaviors in rats."

MYERS, D.E., LOVELY, R.H., & GUY, A.W. (Univ. of Washington, Seattle), "Irradiation of rats by low level 918 MHz microwaves: Delineating the dose-response relationship."

TRAVERS, W.D., & VETTER, R.J. (Purdue Univ., West Lafayette, IN), "Low intensity microwave effects on the synthesis of thyroid hormones and serum proteins."

Session AB-5B: Behavioral Effects (LOVELY, R.H., chmn)

D'ANDREA, J.A., GANDHI, O.P., & LORDS, J.L. (Univ. of Utah, Salt Lake City), "Behavioral effects of resonant electromagnetic energy absorption in rats."

FREY, A.H., & SPECTOR, J. (Randomline Inc., Huntingdon Valley, PA), "Irritability and aggression in mammals as affected by exposure to electromagnetic energy."

SANZA, J.N., & deLORGE, J. (Naval Aerospace Medical Research Laboratory), "Fixed interval behavior in rats exposed to low power densities of microwaves."

Session AB-6A: Selected Topics (ROSENTHAL, S.W., chmn)

HAMRICK, P.E., McREE, D.I., THAXTON, P., & PARKHURST, C.R. (National Institute of Environmental Health Sciences, and North Carolina State Univ.), "Humoral immunity of Japanese quail subjected to microwave radiation during embryogeny."

JOHNSON, C.C., DURNEY, C.H., BARBER P.W. (Univ. of Utah), MASSOUDI H., & ALLEN, S.J. (USAF School of Aerospace Medicine, Brooks AFB, TX), "Radiofrequency radiation dosimetry handbook."

LIBURDY, R.P. (USAF School of Aerospace Medicine, Brooks AFB, TX), "Effects of radiofrequency radiation on peripheral vascular permeability."

McARTHUR, G.R., LORDS, J.L., & DURNEY, C.H. (Univ. of Utah, Salt Lake City), "Effects of 960 MHz microwave on isolated gut segments." (Not given)

SCHWAN, H.R., & FOSTER, K.R. (Univ. of Pennsylvania, Philadelphia), "Free water and the microwave conductivity of tissue."

SEVASTYANOVA, L.A., & POTAPOV, S.L. (Oncological Scientific Center, Moscow, USSR), "Resonance effect in biological action of microwave radiation." (not presented)

SZMIGIELSKI, S., JANIAK, M., & KOBUS, M. (Center for Radiobiology and Radioprotection, & Univ. Medical School, Warsaw, Poland), "Enhancing cytotoxic effect of 3 GHz microwaves for cells treated with membrane-injuring substances."

Session AB-6B: Selected Topics (KRITIKOS, H., chmn)

FERRI, E.S. (FDA, Bureau of Radiological Health, Winchester, MA) "Ascorbic acid levels in rabbit eyes after single and repeated exposure to microwave radiation."

GUY, A.W. (Univ. of Washington, School of Medicine, Seattle), "A method for exposing cell cultures to EM fields under

conditions of controlled temperature and field strength."

HO, H.S., & EDWARDS, W.P. (Bureau of Radiological Health, FDA, USPHS, HEW, Rockville, MD), "Dose rate related effects on the oxygen consumption of mice during and after microwave irradiation."

REED, & OLSON, (Univ. of Utah), "Further characterization of bradycardia observed at 960 MHz."

SZUL, R., & SZUL, M. (Technical Univ. of Warsaw, Poland), "Observations concerning biological active, natural electromagnetic radiation of extremely low intensity." (not given)

Session AB-7A: Hyperthermia (McREE, D.I., chmn)

CHEN, K-M, & GURU, B.S. (Michigan State Univ., East Lansing), "Hyperthermia by local EM heating."

CHEUNG, A.Y., DAO, T., & ROBINSON, J.E. (Univ. of Maryland, Baltimore), "Dual beam TEM applicator for direct contact heating of dielectrically encapsulated malignant mouse tumor."

KANTOR, G., & CETAS, T.C. (Bureau of Radiological Health, FDA & Univ. of Arizona College of Medicine), "A comparative heating pattern study of direct contact applicators in microwave diathermy."

VETTER, R.J., STOETZEL, G.A. (Purdue Univ., West Lafayette, IN), & SHUPE, R. (Indiana Univ. School of Medicine, IN), "Microwave hyperthermia and Co-60 radiation treatment of hamster melanoma."

Session AB-7B: Therapeutic and Diagnostic Applications (CLEARY, S.F., chmn)

BARRETT, A.H., MYERS, P.C., & SADOWSKY, N.L. (M.I.T. Dept. of Physics, Research Laboratory of Electronics, & Faulkner Hosp., Dept. of Radiology), "Application of microwave radiometers to diagnostic medicine."

CONNOR, W.G., ROTH, H.B., McKELVIE, D.H., WILSON, S.E., & CETAS, T.C. (Univ. of Arizona College of Medicine, Tucson), "The use of spontaneously occurring animal tumors for preclinical testing of hyperthermia treatments."

LAI, P-K., CAIN, C.A., & DUCOFF, H.S. (Univ. of Illinois, Urbana), "Suppression by hyperthermia, or by 2450 MHz microwaves, of repair of damage produced by ionizing radiation."

SZMIGIELSKI, S., BIELEC, M., & JANIAK, M. (Center for Radiobiology and Radioprotection, Warsaw, Poland), "Combined effect of microwave hyperthermia and purified bacterial toxins on development of Arcona-180 and Guerin tumors."

Session AB-8A: Developmental and Mutagenic Effects (PICKARD, W.F., chmn)

CHERNOVETZ, M.E. (Tulsa Univ.), OKE, A.F., & JUSTESEN, D.R. (Univ. of Kansas School of Medicine and Kansas City Veterans Administration Hospital), "Microwave-induced teratology in the rat."

GUILLET, R., & MICHAELSON, S. (univ. of Rochester, NY), "The effect of repeated microwave exposure in neonatal rats."

OLSEN, R.G. (Naval Aerospace Medical Research Laboratory, Pensacola, FLA), "Insect pupae teratogenesis in a standing wave irradiation system."

RUGH, R., & McMANAWAY, M. (Bureau of Radiological Health, Rockville, MD), "Can electromagnetic waves cause congenital anomalies?"

Session AB-8B: ELF Effects (POSTOW, E., chmn)

GILLIS, M.F., BEAMER, J.L., RICHARDSON, R.L., ALLEN, C.H., & KAUNE, W.T. (Battelle-Northwest, Richland, WA), "60-Hz electric field exposure system for a miniature swine colony."

GRISSETT, J.D. (Naval Aerospace Medical Research Laboratory, Pensacola, Fla.), "Chronic exposure of primates to electric and magnetic fields associated with ELF communications systems."

KAUNE, W.T., HJERESEN, D.L., BEAMER, J.L., RICHARDSON, R.L., & PHILLIPS, R.D. (Battelle-Northwest, Richland, WA), "Interaction and response of swine to 60 Hz electric fields."

SMITH, R.F. (Univ. of Kansas School of Medicine), & JUSTESEN, D.R. (Kansas City Veterans Administration Hospital), "Effects of a 60-Hz electromagnetic field on locomotive and aggressive behaviors of mice."

Note: Speaker underlined

4611. "International Symposium on Biological Effects of Electromagnetic Waves," sponsored by the International Union of Radio Science (URSI), Commissions A and B, to be held in Airlie, Va. (USA), 30 Oct-4 Nov, 1977 (GUY, A.W., Chmn).

4612. Bureau of Radiological Health "Symposium on Biological Effects and Measurement of RF/Microwaves" (HAZZARD, D.G., chmn.), held in Rockville, Md., Feb. 16-18, 1977.

Session I: Behavioral Effects (SHORE, M.L., chmn.)

FREY, A.H. (Randomline, Inc., Huntingdon Valley, PA), "Behavioral effects of EM energy."

GALLOWAY, W.D. (BRH), "Interactions between microwaves and neuroactive compounds."

HENTON, W.W. (BRH), "Microwave absorption and taste aversion as a function of 915 MHz radiation."

JUSTESEN, D.R. (VA Hospital, Kansas City, KS), "Microwave hyperthermia and the visually evoked response to the guinea pig."

MEDICI, R.G. (UCLA, Los Angeles, CA), "Behavioral protocols and preliminary observation of chicks exposed to weak amplitude modulated 450 MHz electric field."

MONAHAN, J.C. (BRH), "free-operant avoidance and escape from microwave radiation."

Session II: Physical Measurements (SCHNEIDER, R., chmn.)

BASSEN, H.I. (BRH), "Internal and external dosimetry using BRH miniature probes."

CETAS, T. (U. of Arizona), "Infrared emittance of electromagnetic phantom material and infrared transmittance of polyethylene." [presented by G. Kantor, BRH]

CHEUNG, A.Y. (U. of Maryland, College Park), "Implantation electric field measurement within biological tissues."

GUY, A.W. (U. of Washington, Seattle), "Quantitation of biological effects."

HO, H.S. (BRH), "Change in average absorbed dose rate of a group of mice under repeated exposure to 915 MHz microwave radiation."

HO, H.S. (BRH), "Comparison of calculated absorbed dose rate distribution in phantom heads exposed to 2450 MHz and 915 MHz plane wave and slot sources."

KANTOR, G. (BRH), "New types of diathermy applicators - Comparison of performance with conventional types."

NEUDER, S.M. (BRH), "A finite element technique for calculating induced internal field in lossy dielectric media exposed to plane wave electromagnetic radiation."

RABINOWITZ, J.R. (New York U. Medical Ctr.), "Description of a system to irradiate cultured cells with microwaves."

RUGGERA, P.S. (BRH), "Near field measurements of RF fields."

SWICORD, M.L. (BRH), "Broadband measurements of dielectric properties."

Session III: Growth and Development (LEACH, W.M., chmn.)

MICHAELSON, S.M. (U. of Rochester, NY), "Endocrine perturbations in the rat and dog exposed to 2450 MHz CW/Microwaves."

ROSENBAUM, F.J. (Washington U., St. Louis, Mo.), "Biological effects of low level microwave radiation on Tenebrio molitor."

SHORE, M.L. (BRH), "Investigation of repetitive microwave exposure during prenatal development." [in species?]

Session IV: Nervous System Effects (WAXLER, M., chmn.)

ALBERT, E.N. (George Washington U., DC), "Light and electron microscopic observations on the blood brain barrier after microwave irradiation."

BAWIN, S.M. (UCLA, Los Angeles, CA), "Effects of weak oscillating electric fields on ionic binding in cerebral tissue."

LEBOVITZ, R.M. (U. of Texas Southwestern Medical School), "Vestibulocochlear single unit response to microwave radiation."

Session V: Occupational and Ocular Effects (SILVERMAN, C., chmn.)

CARPENTER, R. (BRH), "Histopathological changes in the rabbit lens during development of microwave cataracts."

CARPENTER, R. (BRH), "Are microwave cataracts thermally caused?"

FERRI, E.S. (BRH), "Changes in ascorbic acid levels invoked in the rabbit eye."

HIRSCH, S.E. (Walter Reed Army Institute of Research), "Effects of repeated microwave irradiations to the albino rabbit eye."

ROBINETTE, C.D. (National Research Council, National Academy of Sciences), "Causes of death following occupational exposure to microwave radiation (radar) 1950-1974."

Panel Discussion: "Applicability of reported results for the assessment of potential health hazards of RF/microwave emitting electronic products."

4613. Annual Meeting of the Air Pollution Control Association, Toronto, Canada, June 20-24, 1977.  
ALBRECHT, R.M., and LANDAU, E. (Div. of Biological Effects BRH, FDA), "Microwave radiation: An epidemiologic assessment."
4614. IEEE (MTT-S) International Microwave Symposium, San Diego, CA, June 21-23, 1977.  
KANTOR, G., WITTERS, D.M. (Div. of Electronic Products, BRH, FDA) & GREISER, J.W. (Transco Products, Inc., Venice, CA), "The design and performance of a circularly polarized direct contact applicator for microwave diathermy."
4615. URSI Meeting on Electromagnetic Theory, San Francisco, CA, June 24, 1977.  
NEUDER, S.M. (Div. of Electronic Products, BRH, FDA), & MEIJER, P.H.E. (Catholic Univ. of America), "Induced internal fields in irregular shaped lossy dielectric media exposed to plane wave electromagnetic radiation."
4616. Workshop on the Physical Basis of Electromagnetic Interactions with Biological Systems, Univ. of Maryland, College Park, June 15-17, 1977.  
GANDHI, O.P., & HAGMANN, M.J. (Univ. of Utah, Salt Lake City), "Some recent results on deposition of electromagnetic energy in animals and models of man."
4617. Electromagnetic Radiation Management Advisory Council (ERMAC), 34th Meeting, Meeting, Office of Telecommunications Policy (OTP), Washington, D.C., April 5-6, 1977.  
Agency Program Reviews (and speakers):  
Bureau of Radiological Health (BRH) - VILLFORTH, J., NEILL, R., SHORE, M., CARPENTER, R., HO, H., MONAHAN, J., LEACH, W., SILVERMAN, C., SCHNEIDER, R., BASSEN, H., SWICORD, M., NEUDER, S. (BRH), GUY, A. (U. of Washington), & ROBINETTE, D. (National Research Council, NAS).  
National Institute for Occupational Safety and Health (NIOSH) - HARRIS, E., & CONOVER, D.  
National Institute of Environmental Health Sciences (NIEHS) - McREE, D., & GUY, A. (U. of Washington).  
Veterans Administration (VA) - SMITH, J., JUSTENSEN, D. (VA, Kansas City), McAFEE, R. (VA, New Orleans).  
Federal Aviation Administration (FAA) - RICHARDSON, E. & RIES, F.  
National Bureau of Standards (NBS)--MILLER, C. & RIES, F.  
Federal Communications Commission (FCC) - WANG, J.  
National Science Foundation (NSF) - CAPLAN, N., & BARBER, P. (U. of Utah).
4618. 1977 International IEEE/AP-S Symposium, USNC/URSI Meeting, URSI International Electromagnetic Symposium, June 20-24, held at Stanford Univ. Campus, CA. Containing a session on "Biological effects for applications of microwaves".
4619. International Microwave Power Institute (IMPI) Microwave Power Symposium held in Minneapolis, MN, on May 26-28, 1977. (Including a Session on medical and biological applications).

4620. Conference on Electrical Properties of Biological Polymers, Water, and Membranes [with a session on "Dielectric Behavior of Biopolymers in Strong [Electric Fields]"], (TAKASHIMA, S. & FISHMAN, H.M., organizers), Jan. 26-28, 1977, sponsored by the New York Academy of Sciences, NY, NY.

4621. 13th Annual Microwave Power Symposium of The International Microwave Power Institute (IMPI), to be held in Ontario, Canada, on June 27-30, 1978.

4622. 1978 IEEE AP-S/URSI (Commission A), International Symposium, to be held in Washington, DC, May 15-19 (Bio-effects section?).

4623. Conference on Electrical Properties of Biological Polymers, Water and Membranes [with a session on "Dielectric Behavior of Biopolymers in Strong [Electric Fields]"], (TAKASHIMA, S. & FISHMAN, H.M., organizers), Jan. 26-28, 1977, sponsored by the New York Academy of Sciences, NY, NY.

Appendix 1. CHRONOLOGY OF THE BIBLIOGRAPHY AND SUPPLEMENTS

Report/Supplement	Report Issued by*	Date Released	Contains Citation Numbers	Number of Citations	NTIS* Order No.
Original Bibliography	NMRI	Oct. 4, 1971	1-1966	1966	734-391
Revised Bibliography	NMRI	Apr. 20, 1972	1-1966	[1966]	750-271
Alphabetical Addenda	[Part. of the	Oct. 4, 1971	1967-2054	[ 87]	
Supplement No. 1	Revised	Oct. 5, 1971	2055-2072	[ 17]	
Supplement No. 2	Biblio.]	Nov. 21, 1971	2073-2101	[ 28]	
Supplement No. 3	BUMED	Apr. 17, 1972	2102-2311	209	
Supplement No. 4	NMRDC	June 1, 1973	2312-2638	326	770-621
Supplement No. 5		July 25, 1974	2639-3124	486	784-007
Alphabetical Addenda (to Supplement #5)			3125-3136	11	
Supplement No. 6	NMRDC	June 27, 1975	3137-3378	241	A015-622
Supplement No. 7	NMRI Detach.	May 12, 1976	3379-3723	344	A025-354
Supplement No. 8	NMRI Detach.	Aug. 13, 1976	3724-4055	331	A029-430
Compilation & Integration of Revised Biblio. + 7	NMRI Detach.	Sept 27, 1976	1-3723	3723	?
Suppls. + Addenda (to #5)					
Supplement No. 9	NIOSH	Nov. 8, 1977	4056-4623	567	?
*Key:					
NMRI	Naval Medical Research Institute, Bethesda, MD 20014.				
NMRI Detach.	Naval Medical Research Institute Detachment, Naval Surface Weapons Center, Dahlgren, VA 22448.				
BUMED	Research Division, Bureau of Medicine & Surgery, Dept. of the Navy, Washington, D.C. 20372.				
NMRDC	Electromagnetic Radiation Project Office, Naval Medical Research & Development Command, Bethesda, MD 20014.				
NIOSH	National Institute for Occupational Safety and Health, Rockville, MD 20857.				
NTIS	National Technical Information Service, Springfield, VA 22151.				