May 1976

Seventh Supplement

to

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

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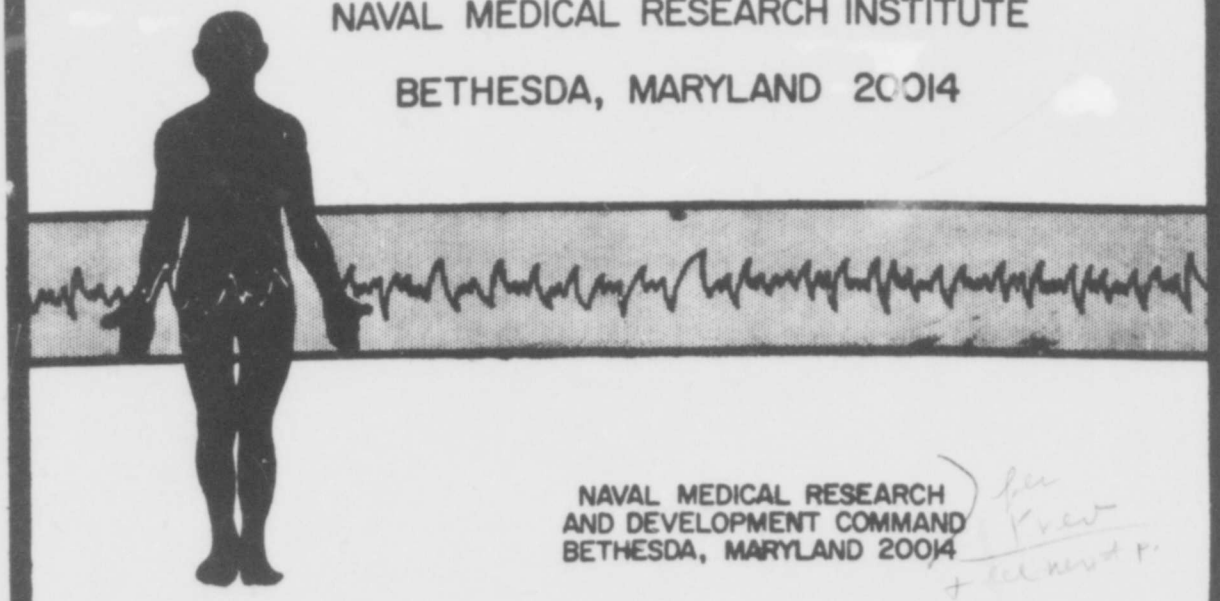
NAVAL MEDICAL RESEARCH INSTITUTE

BETHESDA, MARYLAND 20014



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SEVENTH SUPPLEMENT to

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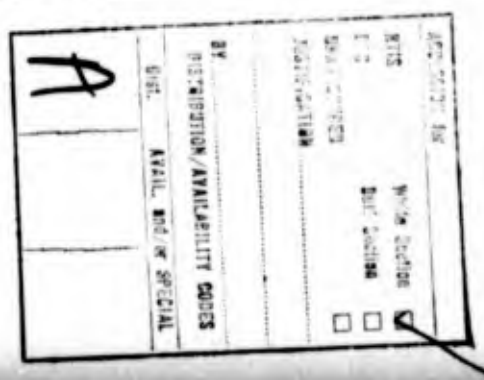
This report is the seventh supplementary "up-dated" bibliographic listing to Naval Medical Research Institute (Bethesda, MD 20014) Research Report No. 2, completed under Research Work Unit MF12.524.015-0004B in October 1971, by the author, and available from National Technical Information Service (Springfield, VA 22151), as AD #734-391. The original report was revised and reprinted in April 1972, and also contains the first three supplements; No. 1 dated October 1971, No. 2 dated November 1971, and No. 3 dated April 1972. The revised report which consists of more than 2300 literature citations, is available from NITS as AD #750-271, and includes, as the first chapter, an outline of the effects which have been attributed to radio frequency and microwave radiation. Supplement No. 4 (containing 327 citations) was completed in June 1973, as an Electromagnetic Radiation (EMR) Project Office Report, Bureau of Medicine and Surgery (Navy), (Washington, DC 20372), and is available from NTIS as AD #770-621. Supplement No. 5 (containing 497 citations) was completed in July 1974 as an EMR Project Office Report, Naval Medical Research and Development Command (NMR&DC, Bethesda, MD 20014), and is available from NTIS as AD #784-007. The sixth Supplement (containing 241 citations) was completed in June 1975 (also as an EMR Project Office, NMR&DC Report), and is available from NTIS as AD #A015-622.

12 May 1976



ABSTRACT

More than 350 additional references on the biological responses to radio frequency and microwave radiation, published up to May 1976, are included in this bibliography of the world literature. Particular attention has been paid to the effects of non-ionizing radiation on man at these 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.

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Key Words

Biological Effects
Bibliography
Electromagnetic Radiation Bio-Effects
Radio Frequency (RF) Radiation
Radiation Effects
Thermogenesis
Health Effects
Radiobiology (Non-ionizing)
Non-ionizing Radiation
Microwave Radiation
Electric-Field Bio-Effects
Magnetic Bio-Effects
Human Factors
Pulsed Electromagnetic Radiation
Stress Physiology
Radar Safety

The comments upon and criticisms of the literature made in this report, and the recommendations and inferences suggested, are those of the author, and do not necessarily reflect the views of the Navy or the Department of Defense.

FOREWORD TO 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 conflicting literature on the biological responses to electromagnetic radiation (EMR) at radio- and microwave-frequencies, with particular reference to the effects of concern to man. Such guidance is needed in the formulation and appraisal of criteria and limits of human exposure to "non-ionizing" electromagnetic radiation, 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 much more difficult and time-consuming task than anticipated, and was actually completed at the time for only about 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 authors are alphabetized, and in chronological order. Multiple authors 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 cited 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

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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.

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The assistance and support received during the preparation of this Supplement have been considerable, and I am happy to acknowledge my indebtedness and gratitute. Dr. Paul Tyler, Head of the Electromagnetic Radiation (EMR) Project Office, Naval Medical Research and Development Command (NMR&DC), and Mr. Christopher Dodge (Science Policy Research Division, Congressional Research Service, Library of Congress) offered frequent advice and encouragement.

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Special help in the acquisition of relevant papers has been received from the librarians and staff members of the Naval Medical Research Institute library, and the Naval Surface Weapons Center/Dahlgren Laboratory Technical Library. Their diligence and resourcefulness in tracing and obtaining copies of a large number of papers and reports, often in spite of incomplete and/or inaccurate citations given in other sources, enabled me to include many relevant items.

The outstanding assistance in many aspects of the preparation of this report by Ms. Judith Allamong has been considerable, and is appreciated. Mrs. Patricia Brown deserves special mention for her outstanding editorial assistance, and especially for her typing and checking of the report.

12 May 1976

SEVENTH SUPPLEMENTARY LISTING

to

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GILBERT, G.O. (Pacific Lutheran U., Tacoma, WA), "Effect of negative air ions upon emotionality and brain serotonin levels in isolated rats," pp. 267-275.

GOMERSALL, J.D. (U. of Sheffield, Whiteley Wood Clinic, England), & STUART, A., "Variations in migraine attacks with changes in weather conditions," pp. 285-299.

HAUF, R. (Im Gärtle, Freiburg, Germany), & WIESINGER, J., "Biological effects of industrial electric and electromagnetic VLF fields," pp. 213-215.

KITAGAWA, N. (Saitama U., Japan), KINOSHITA, K., & ISHIKAWA, T., "Discharge experiments using dummies and rabbits simulating lightning strokes on human bodies," pp. 239-241.

KROGMAN, K.K. (Agriculture Canada Research Station, Lethbridge, Alberta, Canada), & HOBS, E.H., "Evapotranspiration by beans during low-volume sprinkling," pp. 301-306.

LOTT, J.R. (North Texas State U., Denton), & McCAIN, H.B., "Some effects of continuous and pulsating electric fields on brain wave activity in rats," pp. 221-225.

LUDWIG, H.W. (D-2000 Norderstedt 3, Postfach 1349, Germany), "Shielding effect of materials in the ULF, ELF, and VLF region," pp. 207-211.

OLIVEREAU, J.M. (Université de Paris, France), (in French), "Influence of negative air ions on the adaptation of the male rat to an anxiety-producing situation," pp. 277-284.

PERSINGER, M.A. (Laurentian U., Sudbury, Ontario, Canada), & OSSENKOPP, K.P. (U. of Manitoba, Winnipeg, Canada), "Some behavioral effects of pre- and neo-natal exposure to an ELF rotating magnetic field," pp. 217-220.

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KANTOR, G., SWICORD, M.L., & BLAIR, M.J. (Div. of Electronic Products, DHEW), "Heating patterns of enclosed and direct contact microwave diathermy applicators."

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3715. Proceedings of the 5th European Microwave Conference, held 1-4 Sept. 1975 in Hamburg, Federal Republic of Germany.

Session B6—Medical/Biological Applications

AGARWAL, R., HANNAH, S., HARTNAGEL, H., & KENNAIR, J.T. (U. of Newcastle upon Tyne, UK), "A pocket-sized monitor of dangerous microwave power levels."

DEFICIS, A. (O.N.E.R.A.-C.E.R.T., Toulouse, France), "Use of dielectric microprobes for electromagnetic fields measurement."

EDRICH, J. (U. of Denver, CO), "Microwave absorption of living human skin between 8 and 96 GHz."

GRANT, E.H., SHEPPARD, R.J. (Queen Elizabeth College, London), & SOUTH, G.P. (Bradfield College, UK), "The importance of bound water studies in the determination of energy [absorption] by biological tissue."

GUY, A.W., & LOVELY, R.H. (U. of Washington School of Medicine, Seattle), "A system for quantitative chronic exposure of a population of rodents to UHF fields."

ROZZELL, T.C. (Office of Naval Research, Arlington, VA), "Measurement of temperature and microwave power using liquid crystal/optic fiber probes."

Session A3—Invited Papers

CZERSKI, P., & SZMIGIELSKI, S. (Dept. of Human Genetics, National Research Inst. of Mother and Child, Warsaw, Poland), "Microwave bioeffects: Current status and concepts" (p. 348-357).

3716. Proceedings of the Eighteenth Navy Occupational Health Workshop, held October 6-10, 1975, San Diego, Calif.

BAKER, __., "Medical Aspects of ionizing and non-ionizing radiation."

3717. Proceedings of 1975 IEEE International Symposium on Electromagnetic Compatability, San Antonio, TX, 7-9 Oct. 1975.

Session 2A - II. EMC and Spectrum Management in Electro-Optics; A Panel Discussion (AASEN, M.D., & ATKINSON, J.H. (co-chmn)).

HAM, W.T., Jr. (Medical College of VA, Richmond), "Hazards: The effects of optical radiation on biological environments and materials."

RICHARDS, W. (Naval Electronics Laboratory Center, San Diego, CA), "Standards: Systems, components, safety, etc."

Session 5B - II. EMC Related Bio-Instrumentation (MITCHELL, J.C., Chmn.).

BASSEN, H.I. (Bureau of Radiological Health, Rockville, MD), "A broadband miniature, isotropic electric field measurement system."

BRONAUGH, E.L., & KERNS, D.R. (Southwest Research Institute, San Antonio, TX), "Calibration of a multimode microwave exposure chamber."

HOFF, R.J. (McDonnell Douglas Astronautics Co., St. Louis, MO), "EMC measurements in hospitals."

RUGGERA, P.S. (Bureau of Radiological Health, FDA, Rockville, MD), "Radiofrequency E-field measurements within a hospital environment."

TOLER, J.C. (Georgia Institute of Technology, Atlanta), "Electromagnetic interference levels in hospitals."

3718. National Academy of Science/National Research Council, 1975 Annual U S. National Committee/International Union of Radio Science (USNC/URSI) Meeting, University of Colorado, Boulder, October 20-23, 1975: (Relevant Presentations)

Session B-1a: Auditory Effects (FREY, A.H., Chmn.)

CAIN, C.A., & RISSMANN, W.J. (U. of Illinois, Urbana), "Microwave hearing in mammals at 3.0 GHz."

CHOU, C.K., GUY, A.W. (U. of Washington School of Medicine, Seattle), & GALAMBOS, R. (U. of California, San Diego, CA), "Microwave-induced auditory response—cochlear microphonics."

EICHERT, E.S., & FREY, A.H. (Randomline, Inc., Huntingdon Valley, PA), "RF sound: possible mechanisms as defined by recent research." (withdrawn)

JOHNSON, R.B., MEYERS, D., GUY, A.W., LOVELY, R.H. (U. of Washington, Seattle), & GALAMBOS, R. (U. of California, San Diego, CA), "Discriminative control of appetitive behavior by pulsed microwave radiation in rats."

LIN, J.C., & LAM, C-K. (Wayne State U., Detroit, MI), "A theoretical study of microwave-generated auditory phenomena in mammalian cranial structures."

Session B-1b: Microwave Cataractogenesis (ROSENTHAL, S., Chmn.)

AL-BADWAIHY, K.A., & YOUSSEF, A-B. (Cairo U., Egypt), "Biological thermal effect of microwave radiation on human eyes." (not given)

BIRENBAUM, L. (Polytechnic Institute of New York, Brooklyn), KAPLAN, I.T. (Zaret Foundation, CUNY, New York), METLAY, W. (Hofstra U., Hempstead, NY), ROSENTHAL, S.W. (Polytechnic Institute of New York, Farmingdale), & ZARET, M.M. (Zaret Foundation, Scarsdale, NY), "Effects of 35 and 107 GHz CW microwaves on the rabbit eye."

KRAMAR, P., HARRIS, C., GUY, A.W., & EMERY, A. (U. of Washington School of Medicine, Seattle), "Mechanism of microwave cataractogenesis in rabbits."

RABINOWITZ, J.R. (New York U. Medical Center, New York), "The effect of cataractogenic doses of microwave radiation on lenticular transport."

Combined Session: (RICHARDSON, J.M., Chmn.)

JUSTESEN, D.R. (V.A. Hospital, Kansas City, MO), "A rose by another name is a cabbage."

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3718. (Continued)

Session B-2a: Therapeutic Applications (LEHMANN, J.F., Chmn.)

AL-BADWAIHY, K.A., & YOUSSEF, A-B.A. (Cairo Univ., Egypt), "Steady state temperature profiles in microwave diathermy" [paper not presented].

GORDON, G.A., LIVINGSTON, G., & DETHLEFSEN, L.A. (Univ. of Utah, Salt Lake City), "Microwave-induced hyperthermia and radiation sensitivity of mouse intestine."

GUY, A.W., McDOUGALL, J.A., & WEBB, M.D. (Univ. of Washington, Seattle), "Shortwave diathermy applicators."

KANTOR, G., BASSEN, H., & SWICORD, M. (BRH, Rockville, MD), "Mapping of free space and scattered fields in microwave diathermy."

LEHMANN, J.F., GUY, A.W., & STONEBRIDGE, J.B. (Univ. of Washington, Seattle), "Physiologic design criteria for therapeutic applicators operating at 915 MHz."

WEST, B., & REGELSON, W. (M.C.V./V.C.U., Richmond, VA), "Biologic effects of pulsed high frequency electromagnetic radiation" [using a Diapulse Machine].

Session B-2b: Diagnostic Applications (JOHNSON, C.C., Chmn.)

LANDT, J.A. (U. of California, Los Alamos, NM), "Antenna design for a passive temperature monitoring and identification system for livestock."

PEDERSEN, P.C., JOHNSON, C.C., DURNEY, C.H., & BRAGG, D.G. (U. of Utah, Salt Lake City), "Microwave radiation as a diagnostic tool."

SPELMAN, F.A., KINDT, C.W., BOWDEN, D.M., SACKETT, G.P., SPILLANE, J.E. (Regional Primate Research Center at the U. of Washington, Seattle), & BLATTMAN, D.A. (RACON, Inc., Seattle), "Remote measurement of respiration in infant primates using an X-band doppler radar."

Session B-3. Field Survey Instruments (BOWMAN, R., Chmn.)

ASLAN, E. (Narda Microwave, Plainview, NY), "A low frequency H-field radiation monitor."

BASSEN, H., & PETERSON, R. (BRH, Rockville, MD), "Complete measurement of hazardous electromagnetic fields with electro optical crystals."

CONOVER, D.L., PARR, W.H., SENSINTAFFAR, E.L., & MURRAY, W.E., Jr. (NIOSH, Cincinnati, OH), "Measurement of electric and magnetic field strengths from industrial radiofrequency (10-40 MHz) power sources."

RUGGERA, P.S. (BRH, Rockville, MD), "E- and H-field instrumentation and calibration below 500 MHz."

SWICORD, M.L., BASSEN, H.I., HERMAN, W.A., DUFF, J.E., & BING, J.R. (FDA, Rockville, MD), "Methods and instrumentation for the evaluation and calibration of microwave survey instruments."

SWICORD, M.L. (FDA, Rockville, MD), & CHEUNG, A.Y. (U. of Mayrland, College Park), "Mutual coupling between linear antennas."

TRZASKA, H. (Technical U. of Wroclaw, Wroclaw, Poland), "Magnetic field standard at frequencies above 30 MHz."

Session B-4: Cellular and Mutagenetic Effects (McREE, D., Chmn.)

BLACKMAN, C.F., SURLES, M.C., & BENANE, S.G. (EPA, Research Triangle Park, NC), "The effect of microwave exposure on bacteria: mutation induction."

ELDER, J.A., ALI, J.S., & LONG, M.D. (EPA, Research Triangle Park, NC), "Respiratory activity of mitochondria exposed in a coaxial airline to 2000-4000 MHz microwave radiation."

FRAZER, J.W. (USAF School of Aerospace Medicine, Brooks AFB, TX), "A summary of cell and tissue level events produced by RF fields predicted from consideration of regional hyperthermia."

HSIEH, S.T., & SETO, Y.J.(Tuland U., New Orleans, LA), "Microwave perturbation on cellular enzymatic reactions."

LIN, J.C., & CHEN, K.C. (Wayne State U., Detroit, MI), "Effects of microwave radiation on mammalian cells in vitro."

SMIALOWICZ, R.J. (EPA, Research Triangle Park, NC), "The effect of microwaves (2450 MHz) on lymphocyte blast transformation in vitro."

VARMA, M.M., DAGE, E.L., & JOSHI, R. (Howard U., Washington DC), "Mutagenicity induced by non-ionizing radiation in Swiss male mice."

VARMA, M.M., & TRABCULAY, E.A., Jr. (Howard U., Washington, DC), "Evaluation of dominant lethal test and DNA studies in measuring mutagenicity caused by non-ionizing radiation."

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3718. (Continued)

Session B-5: Exposure Systems (SHORE, M., Chmn.)

GRAF, E.R., BURKS, D.G. (Auburn U., AL), & COLE, F.E. (Ochsner Medical Foundation, New Orleans, LA), "A unique electromagnetic environmental simulator."

GUY, A.W., CHOU, C.K., & LOVELY, R.H. (U. of Washington School of Medicine, Seattle), "Chronic exposure of a rat population by circularly polarized guided waves."

HO, H.S., FOSTER, M.R., & SWICORD, M.L. (Bureau of Radiological Health, Rockville, MD), "Microwave irradiation apparatus design and dosimetry."

HOUK, W.M., GRISSETT, J.D., & LONGACRE, A., Jr. (Naval Aerospace Medical Research Laboratory, Pensacola, FL and U. of New Orleans, New Orleans, LA), "Considerations of chamber design, environmental control, and microwave field interactions in small animal experimentation."

LEICHER-PREKA, A. (Inst. Physiol. Biochem. Med. Fac., Sarajevo, Yugoslavia), & HO, H.S. (BRH, Rockville, MD), "Dependence of total and distributed absorbed microwave energy upon size, shape, and orientation of rat phantoms in waveguide."

LOTZ, W.G., & MICHAELSON, S.M. (U. of Rochester, Rochester, NY), "Adrenocortical response in rats exposed to microwaves."

RENO, V.R., & deLORGE, J.O. (Naval Aerospace Medical Research Laboratory, Pensacola, FL), "Field measurements for a series of behavioral studies."

Session B-6a: Behavioral Effects (Low Level Exposure), (JUSTESEN, D., Chmn.)

CLEARY, S.F. (Virginia Commonwealth U., Richmond), "The effects of 1.7 and 2.45 GHz microwaves on drug-induced sleeping time in the rabbit."

GILLARD, J., SERVANTIE, B., BERTHARION, G., SERVANTIE, A.M., OBRENOVITCH, J., & PERRIN, J.C. (Hopital d'Instruction des Armées Sainte-Anne, Toulon Naval, France), "Study of the microwave-induced perturbations of the behaviour by the open-field test into the white rat." [read by S. Rosenthal]

HUNT, E.L. (Walter Reed Army Institute of Research, Washington, DC), KING, N.W., LOVELY, R.H. (U. of Washington, Seattle), & PHILLIPS, R.D. (Battelle Pacific Laboratory, Richland, WA), " 'Avoidance' by rats of a 2.88 GHz pulse microwave field."

MANTHEI, R.C., & GLASER, Z.R. (Naval Surface Weapons Center, Dahlgren, VA), "Alterations in the sleep process of the rabbit as a function of chronic low intensity electromagnetic radiation exposure."

THOMAS, J.R., YEANDLE, S.S., & BURCH, L.S. (Naval Medical Research Institute, Bethesda, MD), "Modification of internal discriminative stimulus control of behavior by low levels of pulsed microwave radiation." [not presented]

Session B-6b: Behavioral Effects (High Level Exposure), (HUNT, E., Chmn.)

D'ANDREA, J.A., GANDHI, O.P., & KESNER, R.P. (U. of Utah, Salt Lake City), "Behavioral effects of resonant electromagnetic power absorption in rats."

deLORGE, J.O. (Naval Aerospace Medical Research Laboratory, Pensacola, FL), "The effects of microwave radiation on behavior and temperature in Rhesus monkeys."

McAFEE, R.D., ELDER, S.T., LIPSCOMB, T.J., MAY, J.G., & HOLLAND, M.G. (Veterans Administration Hospital, New Orleans, LA), "Microwave and infrared radiation effects on an operant response in Rhesus monkeys."

MOE, K.E., LOVELY, R.H., & GUY, A.W. (U. of Washington, Seattle), "Physiological and behavioral effects of chronic low level microwave radiation of rats."

MONOHAN, J.C., & HO, H.S. (Bureau of Radiological Health, Rockville, MD), "Microwave-induced avoidance behavior in the mouse."

Session B-7a: Assessment of Power Deposition in Tissues by Mathematical and Phantom Models (SCHWANN, H., Chmn.)

ALLEN, S.J., HURT, W.D., KRUPP, J.H., RATLIFF, J.A. (USAF School of Aerospace Medicine, Brooks AFB, TX), DURNEY, C.J., & JOHNSON, C.C. (U. of Utah, Salt Lake City), "Measurement of radio frequency power absorption in monkeys, monkey pahntoms, and human phantoms exposed to 10-50 MHz fields."

GANDHI, O.P., SEDIGH, K., BECK, G.S. (U. of Utah, Salt Lake City), & HUNT, E.L. (Walter Reed Army Institute of Research, Washington, DC), "Distribution of electromagnetic energy deposition in models of man with frequencies near resonance."

MacDOUGAL, J., WEBB, M. (U. of Washington, Seattle), & FRAZER, J.W. (USAF School of Aerospace Medicine, Brooks AFB, TX), "Models of biologic interaction with electromagnetic fields."

MASSOUDI, H., DURNEY, C.H., JOHNSON, C.C. (U. of Utah, Salt Lake City), & ALLEN, S. (Brooks AFB, TX), "Theoretical calculations of power absorbed by monkey and human spheroidal and ellipsoidal phantoms in an irradiation chamber."

NEUDER, S.M. (BRH, Rockville, MD), HILL, D.H., & KELLOGG, R.B. (U. of Maryland, College Park), "Power deposition in a multilayered spherical model of the human head."

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Session B-7b: Dielectric Properties of Tissues (SCHWANN, H., Chmn.)

CHEUNG, A.Y., KOOPMAN, D.W., & SWICORD, M.L. (U. of Maryland, College Park), "Wide-band characterization of dielectric and heat properties of simulated biotissues."

ILLINGER, K.H. (Tufts U., Medford, MA), "The attenuation function for biological fluids at millimeter and far-infrared wavelengths."

PYLE, S.D., HU, C.L., CALDWELL, R., & BARNES, F.S. (U. of Colorado, Boulder), "Electric dipole interactions for microwave pulses and damage to embryos."

SWICORD, M., SAFFER, J. (BRH, Rockville, MD), & CHEUNG, A. (U. of Maryland, College Park), "A two impedance method for wide range dielectrometry."

Session B-8a: CNS Effects—I (ADEY, R., Chmn.)

ALBERT, E.N. (The George Washington U. Medical Center, Washington, DC), "Light and electron microscopic investigation of brains exposed to non-ionizing radiation." [Read by E. Postow]

HAWKINS, T.D., & HUNT, E.L. (Walter Reed Army Institute of Research, Washington, DC), "Reduction in sensitivity to audiogenic seizure following a single, 2450 MHz, CW irradiation of rats."

KRITIKOS, H., & TAKASHIMA, S. (U. of Pennsylvania, Philadelphia), "Nonthermal effects of electromagnetic fields on the central nervous system." [Read by H. Schwann]

OSCAR, K.J. (U.S. Army Mobility Equipment R&D Center, Fort Belvoir, VA, and American U., Washington, DC), & HAWKINS, T.D. (Walter Reed Army Institute of Research, Washington, DC), "Electromagnetic radiation effects on the blood-brain barrier system in rats."

Session B-8b: CNS Effects—II (CLEARY, S., Chmn.)

CHAMNESS, F., SCHOLES, H., SEXAUER, S., & FRAZER, J.W. (USAF School of Aerospace Medicine, Brooks AFB, TX), "The effect of 1.6 GHz CW fields on trace metal content of specific regions of rat brain."

MERRITT, J.H., HARTZELL, R., & FRAZER, J.H. (USAF School of Aerospace Medicine, Brooks AFB, TX), "The effect of 1.6 GHz radiation on neurotransmitters in discrete areas of the rat brain."

MIKOLAJCZYK, H. (Institute of Occupational Medicine, Lodz, Poland), "Microwave-induced shifts of gonadotropic activity in anterior pituitary gland of rats." [withdrawn]

WU, C-L., & LIN, J.C. (Wayne State U., Detroit, MI), "Interaction of modulated electromagnetic fields with nervous structures."

Session B-9a: Assessment of Power Deposition in Tissues by Numerical Methods (GUY, A.W., Chmn.)

BARBER, P.W. (U. of Utah, Salt Lake City), "Numerical study of electromagnetic power deposition in biological tissue bodies "

EMERY, A.F., GUY, A.W., KRANING, K.K., & SHORT, R. (U. of Washington, Seattle), "Numerical simulation of the effects of non-ionizing RF radiation upon the human body."

NEUDER, S.M. (BRH, Rockville, MD), & MEIJER, P.H.E. (Catholic U. of America, Washington, DC), "Finite element-variational calculus approach to the determination of electromagnetic fields in irregular geometry."

SPEIGEL, R.J. (ITT Research Institute, Washington, DC), "High voltage electric field coupling to humans using moment method techniques."

UMASHANKAR, K.R., & BUTLER, C.M. (U. of Mississippi, University), "Electromagnetic power absorption in lossy wire model of man."

Session B-9b: Polarization Effects (GUY, A.W., Chmn.)

GITHENS, S.H., HAWKINS, T.D., & SCHROT, J. (Walter Reed Army Institute of Research, Washington, DC), "Colonic temperature changes during microwave exposure."

SCHROT, J., & HAWKINS, T.D. (Walter Reed Army Institute of Research, Washington, DC), "Microwave frequency and E-field orientation interact with animal size."

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Session B-10a: Effect of ELF Fields on Biological Systems—I (PHILIPS, R., Chmn.)

BAWIN, S.M., & ADEY, W.R. (U. of California, Los Angeles), "Effects of weak low frequency electric fields on calcium efflux from isolated chick and cat brain."

BLISS, V., & HEPPNER, F. (U. of Rhode Island, Kingston), "Effects of the field free space on the circadian activity rhythm of the house sparrow, Passer domesticus, and of the song sparrow, Melospiza melodia."

DURFEE, W.K., PLANTE, P.R., MARTIN, P., MUTHUKRISHNA, S., & POLK, C. (U. of Rhode Island, Kingston), "Exposure of domestic fowl to ELF electric and magnetic fields."

GREENEBAUM, B., GOODMAN, E.M., & MARRON, M.T. (U. of Wisconsin-Parkside, Kenosha), "Long-term effects of weak 45-75 Hz electromagnetic fields on the slime mold Physarum polycephalum."

MATHEWSON, N.S., OOSTA, G.M., OLIVA, S.A., & BLASCO, A.P. (AFRRI, Defense Nuclear Agency, Bethesda, MD), "Effects of 45 Hz electric field exposure on rats."

Session B-10b: Effect of ELF Fields on Biological Systems—II (BIRENBAUM, L., Chmn.)

MEDICI, R.G. (U. of California, Los Angeles), "The effects of weak ELF electric fields on schedule-controlled behavior of monkeys."

MORAN, W.P. (U. of Tulsa, OK), "Physiological basis of human electric shock threshold."

SUGIYAMA, S., & MIZUNO, K. (Kwansei Gakuin U., Hyogo, Japan), "Effect of AC electric field application upon human visual threshold."

GREENBURG, B. (U. of Illinois at Chicago Circle, Chicago), "Impact of extremely low frequency electromagnetic fields on animals in nature."

Session B-11: Measurement of Power Deposition in Biological Tissues (ROZZELL, T., Chmn.)

BOWMAN, R.R. (National Bureau of Standards, Boulder, CO), "A temperature probe for RF heated material."

CETAS, T.C. (BRH, Rockville, MD), "A birefringent crystal optical thermometer for measurements of electromagnetically induced heating."

CHEN, K.M., GURU, B.S., & NYQUIST, D.P. (Michigan State U., East Lansing), "Quantification and measurement of induced fields inside finite biological bodies."

CHEUNG, A.Y. (U. of Maryland, College Park), SWICORD, M.L., & BASSEN, H.I. (BRH, Rockville, MD), "Experimental calibration of a miniature electric field probe within muscular tissues."

CHRISTENSEN, D.A. (U. of Utah, Salt Lake City), "Optical etalon temperature sensor for microwave tissue heating applications."

DEFICIS, A. (O.N.E.R.A.-C.E.R.T., France), "Use of dielectric microprobes for electromagnetic fields measurement."

LIVINGSTON, G.K., JOHNSON, C.C., DURNEY, C.H. (U. of Utah, Salt Lake City), & ROZZELL, T.C. (Office of Naval Research, Arlington, VA), "Performance of the LCOF probe in calorimetric and tissue temperature monitoring applications."

Session B-12: General Biological Effects (MICHAELSON, S., Chmn.)

BURKS, D.G., & GRAF, E.R. (Auburn U., AL), "Investigation of electromagnetic effects of a 1000-foot TV tower on migratory birds."

HOUK, W.M., MICHAELSON, S.M., & BEISCHER, D.E. (Naval Aerospace Medical Research Laboratory, Pensacola, FL, and U. of Rochester, Rochester, NY), "The effects of environmental temperature on thermoregulatory, serum lipid, carbohydrate and growth hormone responses of rats exposed to microwave."

KINDT, C.W., BOWDEN, D.M., SPELMAN, F.A., & MORGAN, M.K. (Regional Primate Research at the U. of Washington, Seattle), "Some developmental and behavioral factors of low intensity X-band radiation."

MAXEY, E.S. (Miami Heart Institute, Miami, FL), "Critical aspects of human versus terrestrial electromagnetic symbiosis."

MITCHELL, J.C., & HURT, W.D. (USAF School of Aerospace Medicine, Brooks AFB, TX), "The biological significance of radiofrequency radiation emission characteristics on cardiac pacemaker performance."

O'GRADY, T.C., MILROY, W.C., & GLASER, Z.R. (Naval Surface Weapons Center, Dahlgren, VA), "Long term exposure studies of high peak power (HPP) pulsed electromagnetic radiation on mice."

STAVINOHA, W.B., MEDINA, M.A., WEINTRAUB, S.T., ROSS, D.H., & MODAK, A.T. (U. of Texas Health Science Center, San Antonio), "The effects of 19 megacycle irradiation on mice and rats."

TELL, R.A., & JANES, D.E. (EPA, Washington, DC), "Broadcast radiation: A second look."

WOOLAS, K.D. (MOD, United Kingdom), "Health hazards in microwave fields."

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Session B-13: Selected Topics (ALTSCHULER, H.M., Chmn.)

ALLIS, J.W., & FROMME, M.L. (EPA, Research Triangle Park, NC), "Pseudosubstrate binding to ribonuclease during exposure to microwave radiation at 1.70 and 2.45 GHz."

CARPENTER, R.L., & HAGAN, G.J. (BRH, Winchester, MA), "Comparison of thermal effects in the rabbit eye from microwave radiation and from external heating."

FERRI, E.S., & HAGAN, G.J. (BRH, Winchester, MA), "Chronic low-level exposure of rabbits to microwaves."

GLASER, Z.R. (Naval Surface Weapons Center, Dahlgren, VA), & DODGE, C.H. (Library of Congress, Washington, DC), "Biomedical aspects of radiofrequency and microwave radiation: A review of selected Soviet, East European, and Western references."

GUILLET, R., LOTZ, W.G., & MICHAELSON, S.M. (U. of Rochester, NY), "Time-course of adrenal response in microwave-exposed rats."

HAGAN, G.L., & CARPENTER, R.L. (BRH, Winchester, MA), "Microwave frequency as a factor in the induction of lens opacities in the rabbit eye."

MAGIN, R.L., LU, S-T., & MICHAELSON, S.M. (U. of Rochester, NY), "Thyroid response to localized microwave exposure."

MASSOUDI, H., DURNEY, C.H., JOHNSON, C.C. (U. of Utah, Salt Lake City), & ALLEN, S. (Brooks AFB, TX), "Theoretical calculations of power absorbed by an ellipsoidal model of man and animals in an electromagnetic plane wave."

MICHAELSON, S.M. (U. of Rochester, NY), "The influence of microwave exposure on neuroendocrine function in the rat and dog."

MURACA, G.J., Jr., & FERRI, E.S. (BRH, Winchester, MA), "A study of the effects of microwave irradiation of the rabbit testes."

SANDLER, S.S. (Northeastern U., Boston, MA), "Electromagnetic field effects on isolated nerve tissue."

SEAMAN, R.L., WACHTEL, H., & JOINES, W.T. (Duke U., Durham, NC), "The use of stripline to study microwave biological effects."

3719. The Congenital Anomalies Research Association of Japan and the Japan Society of Human Genetics—Joint Conference, Tokyo, Japan, November 7-9, 1975. (Presentation given by title only.)

RUGH, R., & LEACH, W.M. (Division of Biological Effects, BRH), "Microwave teratogenesis in mice."

3720. American Public Health Association Annual Conference, Chicago, Illinois, November 16-20, 1975.

LANDAU, E. (American Public Health Assoc.), & ALBRECHT, R.M. (Division of Biological Effects, BRH), "Microwave radiation: An epidemiologic assessment."

3721. Proceeding of the Ninth Midyear Topical Symposium, Health Physics Soc., Denver, Colorado, February 9-12, 1976.

CZERSKI, P. (FDA Visiting Scientist, Division of Biological Effects, and Dept. of Genetics, National Research Inst. of Mother & Child, Warsaw, Poland), "Comparison of the USA, USSR, and Polish microwave permissible exposure standards."

3722. "Measurements for Safe Use of Radiation," National Bureau of Standards 75th Anniversary Symposium, March 1-4, 1976, Gaithersburg, MD.

Session on Measurement System

SWICORD, M.L., BASSEN, H.I., & HERMAN, W.A. (Bureau of Radiological Health, FDA), "Methods for the evaluation and calibration of microwave survey instruments."

Session on Standardization and Measurement Assurance

BAIRD, R.C. (National Bureau of Standards), "Non-ionizing radiation and standardization."

Session on Environment and Personal Protection

TELL, R.A., HANKIN, N.N., NELSON, J.C., ATHEY, T.W., & JANES, Jr., D.E. (U.S. Environmental Protection Agency), "An automated measurement system for determining environmental radiofrequency field intensities."

THIEL, J.F. (Texas Dept. of Health Resources), "Radio-frequency electromagnetic radiation from portable and mobile telecommunication transmitters."

3723. American Industrial Hygiene Association Conference, Atlanta, Georgia, May 16-21, 1976.

ALBRECHT, R.M. (Division of Biological Effects, BRH), "Potential adverse effects of exposure to nonionizing radiation."

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More than 350 additional references on the biological responses to radio frequency and microwave radiation, published up to May 1976. are included in this bibliography of the world literature. Particular attention has been paid to the effects of non-ionizing radiation on man at these 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.
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This report is the seventh supplementary "up-dated" bibliographic listing to Naval Medical Research Institute, (Bethesda, MD 20014) Research Report No. 2, completed under Research Work Unit MF12.524.015-004B, in October 1971, by the author, and available from National Technical Information Service (Springfield, VA 22151) as AD #734-391. The original report was revised and reprinted in April 1972, and also contains the first three supplements; No. 1 dated October 1971, No. 2 dated November 1971, and No. 3 dated April 1972. The revised report which consists of more than 2300 literature citations, is available from NTIS as AD #750-271, and includes as the first chapter, an outline of the effects which have been attributed to radio frequency and microwave radiation. Supplement No. 4 was completed in June 1973, as an Electromagnetic Radiation (EMR) Project Office Report, Bureau of Medicine and Surgery (Navy), (Washington, DC 20372), and is available from NTIS as AD #770-621. Supplement No. 5 was completed in July 1974 as an EMR Project Office Report, Naval Medical Research and Development Command (NMR&DC, Bethesda, MD 20014), and is available from NTIS as AD #784-007. The sixth Supplement was completed in June 1975, also as an EMR Project Office, NMR&DC Report, and is available from NTIS as AD #A015-622