

GARY M. RAND, Ph.D.

Home: 17093 Gulf Pine Circle
Wellington, Florida 33414
(561) 333-9751, 333-4859 (fax)

University: Ecotoxicology and Risk Assessment
Department of Environmental Studies/SERC
Florida International University
Biscayne Bay Campus
3000 N.E. 151st Street
North Miami, Florida 33181
Tel (305) 919-5869 (laboratory)
Fax (305) 919-5887
e-mail: randg@FIU.edu

EXPERIENCE SUMMARY

Direct multidisciplinary environmental staffs, prepare budgets, long-range planning.

Design and conduct of laboratory and field research programs for aquatic (freshwater, estuarine, marine)/terrestrial studies to assess the safety of chemical compounds including pesticides, metals, petroleum hydrocarbons, and PCBs to the environment.

Prepare ecological risk assessments for regulatory submissions.

Natural resource damage assessments for hazardous waste sites.

Coordinate and direct activities related to water pollution, hazardous waste sites/groundwater/soil contamination, effluent (industrial/municipal wastewater) and sediment quality.

Knowledge of CERCLA/RCRA, CWA and NPDES program, biological/toxicity techniques and chemical-specific analyses to assess effluent discharges including procedures to conduct studies to determine cause(s) of toxicity (TIEs) and develop remediation strategies (TRES).

Knowledge of environmental regulatory requirements (FDA, FIFRA, TSCA, EU) applicable to ecotoxicological activity and development of compounds for U.S. and international registration.

Toxicology support of environmental litigation.

Occupational exposure assessments associated with all activities of pesticide application in the field.

Liaison with trade associations, agrochemical and pharmaceutical industries, U.S. and international regulatory agencies.

Provide counsel in environmental risk analysis to industry/regulatory agencies in U.S. and in Europe.

Senior editor of book series in ecotoxicology/environmental chemistry.

PROFESSIONAL BACKGROUND

ASSOCIATE PROFESSOR, Department of Environmental Studies, Southeast Environmental Research Center (SERC), Florida International University. August 1996 to Present.

Director of ecotoxicology laboratory (<http://serc.fiu.edu>). Designed and constructed new state-of-the-art ecotoxicology laboratory building on Biscayne Bay. Conducts research on: acute and chronic effects of pesticides, metals, PAHs, PCBs and other foreign chemicals on freshwater, estuarine, marine, wetland and terrestrial species; effects of wastewaters and contaminated soils/sediments and identification of toxics (toxicity identification evaluations) and appropriate pollution remediation strategies (toxicity reduction evaluations). Prepares aquatic and wildlife probabilistic ecological risk assessments to define potential for ecological effects at the community, population and ecosystem levels. Present research on ecosystems in South Florida from the St. Lucie River watershed to the Florida Keys including Everglades (e.g., Florida Bay) and Biscayne National Parks (e.g., Biscayne Bay). Present aquatic risk assessments in C-111 canal and in South Biscayne Bay and Northeast Florida Bay.

Teach undergraduate courses (3 credits each): Introduction to Environmental Sciences, Environmental Resources and Pollution, Water Resources and Water Quality Laboratory. Teach graduate courses (3 credits each): Ecotoxicology, Ecological Risk Assessment. Designed curricula for senior undergraduate water quality analysis laboratory and graduate courses in ecotoxicology and risk assessment.

Chair/member of M.S./Ph.D. (7) committees. Support four graduate students (research assistants), two technicians and one post-doc. Graduated one student in 1998, one student in 2002 and four graduate students to defend and graduate by May 2003.

SENIOR SCIENTIST & DIRECTOR, ECOTOXICOLOGY, Ecological Services Inc. - November 1994 to July 1996.

Provide counsel to agrochemical industry and regulatory agencies on the fate and effects of chemicals in aquatic and terrestrial ecosystems. Prepare predictive and retrospective ecological risk assessments to support regulatory requirements for major Federal (e.g., CERCLA/SARA, CWA, FIFRA) and international statutes. Conduct field studies in freshwater, brackish, marine, terrestrial and wetland ecosystems to identify biological impact and injury and develops strategies for remedial actions when necessary for point and non-point sources of pollution. Technical support in toxic tort litigation involving potential impact of foreign chemicals to aquatic organisms and wildlife. Administratively responsible for managing staff, budgets and planning.

ADJUNCT PROFESSOR, Nova Southeastern University, Oceanographic Center - September 1994 to 1999.

Teach graduate courses (3 credits each)

- Fundamentals of Aquatic Ecotoxicology (December 1994, 1995, 1996, 1999)
- Biological Effects and Risks of Chemicals in the Aquatic Environment (April 1995, September 1996)
- Biostatistics (June 1996, 1997)

Developed curricula for above three courses.

Chair/member of M.S.committees (2).

DIRECTOR/VICE PRESIDENT, Toxikon Environmental Sciences - June 1989 to November 1994.

Designed and developed environmental toxicology contract research company to provide services for industry and regulatory agencies. Administratively responsible for a laboratory and field station and management of staff of approximately thirty-five to forty professionals (M.S., Ph.D.) of ecologists, aquatic toxicologists, modelers and environmental chemists with annual budget of 2-3 million dollars. Designed and developed state-of-the-art aquatic toxicology laboratory with static and flow-through systems and microcosm field station to conduct outdoor simulated field studies to assess stress to organisms in freshwater, estuarine and marine ecosystems.

Conducts laboratory and field (microcosm, pond) studies for the chemical, petroleum and pharmaceutical industries and state and federal regulatory agencies to determine the environmental fate of chemicals (including pesticides, PAHs) and their toxicological effects on freshwater, estuarine, and marine ecosystems. Laboratory studies evaluated the acute and chronic effects of chemicals on development, growth, reproduction and survival of organisms. Field studies evaluated chemical impact on the structure and function of aquatic communities and the distribution and persistence of chemicals in different environmental matrices. Responsible for experimental design of special laboratory and field aquatic programs and protocols on sediment bound lipophilic chemicals, and to evaluate behavioral and physiological effects. Provides counsel and prepares regulatory submissions for industry on the potential hazards associated with chemical exposure in the environment regarding both biological effects to aquatic and avian/wildlife species and the fate of chemicals in water and sediment (and soil) systems. Conducts site investigations and prepares ecological risk assessments under FIFRA and at Superfund sites to describe quantitatively and qualitatively the nature and magnitude of potential risks to the environment as a result of exposure to pesticides and metals. Fate and effects models used in risk assessments. Interacts with state, federal and international regulatory agencies on ecotoxicology issues and the development and registration of agrochemicals including drugs.

Member of Ph.D. committee in Ecotoxicology - University of Miami, Rosentiel School of Marine and Atmospheric Science - 1994 to 1997.

ADJUNCT ASSOCIATE PROFESSOR, University of South Florida, College of Public Health, Department of Environmental and Occupational Health - August 1992 to August 1993.

CORPORATE ENVIRONMENTAL TOXICOLOGIST, Florida Power and Light Company - April 1987 to June 1989.

Serve as the corporate advisor to largest electric utility company in Florida on issues of toxicological importance (e.g., air toxics, water toxics, hazardous wastes). Manage and develop all toxicology research programs to resolve/mitigate problems related to hazardous wastes/industrial effluents. Provide advice and guidance on cost-effective means to solve toxicology concerns. Prepare comments, toxicology reviews and environmental risk assessments regarding public health and ecological safety. Interact with regulatory agencies and trade associations.

Conducts laboratory and field studies on the acute and chronic effects of asbestos and effluents on freshwater and marine organisms, modeling/field validation studies on the fate of chemicals including heavy metals and petroleum in surface and groundwater and bioremediation treatment studies to degrade toxic compounds.

MANAGER, ENVIRONMENTAL TOXICOLOGY, Corporate Toxicology, FMC Corporation - September 1985 to March 1987. (See below).

SUPERVISOR, ENVIRONMENTAL TOXICOLOGY, Corporate Toxicology, FMC Corporation - January 1984 to August 1985.

Administratively responsible for the management of professional staff, preparation of budgets and long-range planning. Technically responsible for the management and design of all U.S. and international aquatic, avian and wildlife toxicology programs (i.e., totaling approximately 7 million dollars per year) to assess the safety of pesticides and other chemical compounds for registration. Programs include laboratory and field (e.g., pond, mesocosm, terrestrial) studies with aquatic (i.e., freshwater, estuarine, marine) and avian species. Conducts ecotoxicological risk assessments for various agroecosystems.

Responsible for risk assessment studies of agricultural field workers exposed to pesticides and other related matters. Coordinate activities on groundwater contamination and water pollution control. Provide technical support to corporate and division management on the fate and effects of chemicals in the environment. Interact with analytical, residue and metabolism groups to develop programs. Involved with pesticide registration process in the U.S. and in Europe including Special Review of a pesticide in the U.S. Serve as scientific liaison with state, federal and international regulatory agencies and contract facilities.

SENIOR TOXICOLOGIST, Corporate Toxicology, FMC Corporation - August 1982 to January 1984.

Responsible for the design and management of both intramural and extramural pesticide toxicology programs (i.e., totaling approximately 5 million dollars) which include acute, sub chronic and chronic (e.g., oncogenicity, reproduction) laboratory and field studies with mammalian, aquatic, avian and microbial species via different routes of administration. Programs also include genetic toxicity studies.

Conducts human and environmental health risk assessments. Responsible for providing toxicology support to management on health and safety assessments. Serve as liaison with trade associations, regulatory agencies and contract facilities.

ADJUNCT ASSOCIATE PROFESSOR, Drexel University, Environmental Studies Institute - February 1983 to February 1985.

Teach graduate courses in aquatic toxicology and aquatic ecology. Advisor/sponsor for Ph.D. students. Member of Ph.D. (2) committees in aquatic toxicology.

ASSOCIATE CORPORATE TOXICOLOGIST, Corporate Toxicology, Occidental Petroleum Corporation (Hooker Chemical Company) - February 1979 to July 1982.

Responsible for management of staff, and the design and management of toxicology programs at various divisions of the company. Programs include acute and sub chronic mammalian studies and mutagenicity testing. Aquatic/environmental programs include studies with fish, invertebrates and birds that involve acute and chronic exposure. Also responsible for designing environmental fate studies.

Evaluation of data from mammalian and ecological toxicology programs and preparation of risk assessments on new chemicals and at hazardous waste sites in New York (Love Canal), Michigan (Montague) and California.

Provide technical support and guidance to the divisions, corporate staff (medical, industrial hygiene, safety) and management on toxicology problems and questions.

Provide reviews related to the toxicology of company products, intermediates and raw materials in order to evaluate their safety. Set internal company occupational exposure limits for chemicals in the plant.

Assure that toxicology policies, procedures and programs are in compliance with federal, state, and international regulations.

Initiate and coordinate biomonitoring programs at the divisions to evaluate the toxicity of effluents to aquatic life.

Provide special expertise in aquatic, environmental and mammalian toxicology and apply it to special environmental problems (e.g., waste disposal sites, groundwater contamination) and litigation.

LECTURER, State University of New York at Buffalo, School of Medicine - September, 1980 to May, 1982.

Lecture to freshman medical students in the area of environmental toxicology.

NATIONAL INSTITUTE OF HEALTH POSTDOCTORAL RESEARCH FELLOW/TRAINEE IN TOXICOLOGY, North Carolina State University - November 1977 to February 1979.

Research on the neurotoxic effects of acute and chronic pesticide exposure on aquatic and mammalian organisms.

ENVIRONMENTAL TOXICOLOGIST, Raytheon Company - February 1976 to September 1977.

Perform contract-oriented toxicity studies to assess the effects of potentially toxic substances on aquatic organisms.

Conduct field studies and hazard assessments on environmental agents.

Responsible for designing and setting up an aquatic toxicology lab.

TEACHING ASSISTANT IN GENERAL BIOLOGY AND CELLULAR BIOLOGY, Texas A&M University - September 1972 to January 1976.

Research on the effects of pesticides and polycyclic aromatic hydrocarbons on aquatic organisms.

RESEARCH ASSISTANT IN GENETICS, Osborn Laboratories, New York Aquarium - September 1971 to August 1972.

SCIENCE TEACHER, New York - January 1966 to June 1971.

RESEARCH

Freshwater Inflow and Wastewaters into Marine Systems: Effects of Salinity Changes and Development of Numerical Water Quality Criteria for Contaminants Using Physiological Performance Measurements Relevant to Estuarine Indicator Species in South Florida (281k for 2 years- National Park Service; 2002-2004)

Sediment Bioassay and Toxicity Identification/Evaluation Methods
Adaptation to the Central and South Florida System (104K for 2 years-
South Florida Water Management District; 2002-2004)

Screening Level Risk Assessment to Determine Potential High
Priority Contaminants and Natural Resources at Risk in Biscayne and
Everglades National Parks: Critical Information Needs for the
Comprehensive Everglades Restoration Plan (CERP) (735K for 3 years-U.S.
Dept. of the Interior; 2001-2004)

Gulf of Mexico: Offshore Oil Impact to Marine Organisms (2.2 million for 2
years-PEMEX of Mexico; pending 2003)

Sediment Bioassay and Toxicity Identification/Evaluation Methods
Adaptation to the Central and South Florida System (137K for 2 years-
South Florida Water Management District; 1999-2001)

Initial Hazard Assessment of South Florida Ecosystems (27K-U.S.
Geological Survey; 2000-2001)

Use of Biomarkers to Assess Stress of Chemicals on Ospreys in
Florida Bay (20K- U.S. Dept. of the Interior, National Park Service; 2000)

Health Effects of Pesticides in Farm Workers (8.5K- University of
South Florida/NIOSH; 2000)

Study of Gulf Coast Oil Contingency Plans with Respect to
Remediation and Restoration (188K- collaboration with University of Miami
& Nova Southeastern University; NOAA; 1996-1997)

Evaluation of Biological Indicators for Assessment and Prediction
of Adverse Ecological Impacts from Contaminants in Coastal Ecosystems
(151K- collaboration with Mote Marine Laboratory: U.S. EPA Gulf of
Mexico Program; 1995-1997)

Aquatic Risk Assessment of the Pyrethroid Mosquito Adulticide
Resmethrin (55K- AgrEvo Chemical Co.; 1996-1997)

Aquatic Risk Assessment of Malathion (80K- State of South Carolina; 1994-
1996)

Fate and Effects of the Insecticide-Miticide Chlorfenapyr
using Outdoor Microcosms (300K- American Cyanamid Co.; 1992-1994)

Aquatic Risk Assessment of the Insecticide Carbaryl (50K- Rhone-
Poulenc Ag Co.; 1993-1994)

Aquatic Risk Assessment of the Pyrethroid Fenpropathrin (45K-Valent
Chemical Co./Sumitomo Chemical Co.; 1993)

Aquatic Risk Assessment of the Fungicide and Antifoulant Chlorothalonil

(75K-ISK Biotech Co.; 1992-1993)

Fate and Effects of Pyridaben using Outdoor Microcosms (1.6 million- BASF Corp.; 1992-1994)

Aquatic Risk Assessment of the Herbicide, Prodiamine (50K- Sandoz Crop Protection Corp.; 1991)

Laboratory Studies (Acute and Chronic) on the Fate and Effects of Chemicals (2-3 million/year-BASF, Monsanto, Dow Chemical, DuPont, Nissan Chemical, AgrEvo, American Cyanamid; 1989-1994)

Bioremediation and Ecological Risk of Soil Contaminated with #6 Fuel Oil (Ft. Meyers, FL)(250K-Florida Power & Light Co.; 1987- 1989)

Effects of Effluents and Contaminated Sediments on Aquatic Organisms (150K- Florida Power and Light Co.; 1987-1989)

Effects of Organophosphate and Carbamate Insecticides on Birds and Wildlife Populations in Florida, Texas, Iowa, Illinois, Utah and Wisconsin (5 million- collaboration with Brigham Young University: FMC Corp.; 1982-1987)

Effects of Pyrethroids (permethrin, cypermethrin, biphenethrin), Endosulfan and Organophosphates (ethion) on Aquatic Ecosystems using Outdoor Ponds and Simulated Systems (4 million- collaboration with Academy of Natural Sciences, ICI and Hoechst Chemical Co., Makhteshim-Agan Chemical Co.: FMC Corp.; 1982-1987)

Avian/Wildlife Risk Assessment of the Insecticide Carbofuran (200K-FMC Corp.; 1983-1985)

Laboratory Studies on the Acute and Chronic Effects of Pesticides on Aquatic and Avian Species (2 million-FMC Corp.; 1982-1987)

Acute and Chronic Effects of Effluents and Contaminated Sediments from the Niagara River, Great Lakes, Tacoma, Washington (500K- Chemical Co./Occidental Petroleum Corp.; 1979-1982) Hooker

Assessment of Ecological Damage Adjacent to Hazardous Waste Sites at Love Canal, NY, Montague, MI, Lathrop, CA, etc. (2 million- Chemical Co./Occidental Petroleum Corp.; 1979-1982) Hooker

PROFESSIONAL AFFILIATIONS, MEMBERSHIPS, SCIENTIFIC ADVISORY PANELS

Nonlinearity in Biology, Toxicology and Medicine (Founding Member, Editorial Board, 2003-present)
Biomarkers (Editorial Board, 1995-present)

Ecotoxicology (Associate Editor, 2000-2002; Editorial board, 2002-present)

Ecotoxicology and Risk Management Scoping Committee for the South Florida Restoration (1998-present)

Ecological Risk Focus Group of South Florida Forum (1998-present)

Expert Review Group for Lake Apopka North Shore Pesticide Evaluation (St. Johns River Water Management District)(1999-present)

Society of Environmental Toxicology and Chemistry (Co-Chair Soil Advisory Committee, 1999-2001)

Agency for Toxic Substances and Disease Registry, Department of Health and Human Services (Board of Scientific Counselors, 1988-1991)

Edison Electric Institute (Chairman of Health Assessment/Toxicology Task Force, Safe Drinking Water Act Task Force, 1987-1989)

Utility Water Act Group (Biological Testing Subcommittee, Water Quality Subcommittee, 1987-1989)

Society of Environmental Toxicology and Chemistry; Charter Member (Editorial Board of Society Journal, Hazard Assessment Section 1987-1989)

Electric Power Research Institute (Air Pollution/Inhalation Toxicology Advisory Committee, 1987-1989)

National Agricultural Chemicals Association (Chairman of Environmental Toxicology and Chemistry Committee, 1985-1987)

American Association for the Advancement of Science (1976-present)

Chemical Manufacturers Association (Water Quality Task Committee, 1979-1981)

WORKSHOPS

Organized/Chaired the following sessions/workshops:

South Florida Ecosystems at Risk. Sponsored by the Society of Environmental Toxicology and Chemistry at Twenty-Second Annual Meeting. November 2001. Baltimore, Maryland. Edited special monograph edition of Ecotoxicology to be published in 2003.

Environmental Effects on South Florida Ecosystems. Sponsored by the Society of Environmental Toxicology and Chemistry at Nineteenth Annual Meeting. November 1998. Charlotte, N.C.

Workshop on Ecological Risk of Toxic Substances in South Florida Ecosystems: Linking Exposure, Toxicological Effects and Risk Management to Sustainable Restoration of Aquatic and Wildlife Ecosystems. Sponsored by Florida International University, U.S.EPA, NOAA and USGS. October 1998. Miami, FL.

Environmental Education. Sponsored by the Society of Environmental Toxicology and Chemistry at the Seventeenth Annual Meeting. November 1996. Washington, DC.

Aquatic Toxicology. Sponsored by the Society of Environmental Toxicology and Chemistry at the Seventeenth Annual Meeting. November 1996. Washington, DC.

Toxic Substances Roundtable. Sponsored by South Florida Water Management District. October 1996. West Palm Beach, FL. Facilitator and presenter of ecological and human health risk assessment seminars.

State of Practice of Risk Assessment in Human Health and Environmental Decision Making. December 1995. Florida State University, Tallahassee, FL. Edited special monograph in Human and Ecological Risk Assessment 1998, Volume 4, Number 4.

Wildlife Risk Assessment. Sponsored by the Society of Environmental Toxicology and Chemistry at the Second SETAC World Congress. November 1995. Vancouver, BC.

Avian Toxicity Field Studies. Sponsored by the National Agricultural Chemicals Association for industry, academia and the regulatory agencies. September 1986. Washington, DC.

Aquatic Toxicity Field Studies. Sponsored by the National Agricultural Chemicals Association for industry, academia and the regulatory agencies. October 1986. Washington, DC.

Pesticide Risk Assessment in Aquatic Systems. Sponsored by the Society of Environmental Toxicology and Chemistry at the Seventh Annual Meeting. November 1986. Alexandria, Virginia.

BOOKS

Rand, G.M. and Petrocelli, S.R. (Editors). 1985. FUNDAMENTALS OF AQUATIC TOXICOLOGY: METHODS AND APPLICATIONS. Hemisphere Publishing Corporation, N.Y. Textbook/reference book. Recipient of honorable mention award for best Life Sciences book in 1985 at the Tenth Annual Professional and Scholarly Book Awards sponsored by the Association of American Publishers.

Rand, G.M. (Editor). 1995. FUNDAMENTALS OF AQUATIC TOXICOLOGY: EFFECTS, ENVIRONMENTAL FATE AND RISK ASSESSMENT. Second Edition. Taylor and Francis, Washington, D.C.

Rand, G. M. and Lewis, M.A. FUNDAMENTALS OF AQUATIC TOXICOLOGY. Third Edition. In Preparation.

Rand, G.M., Lewis, M.A., and Calo, P. (Editors). CURRENT TOPICS IN ECOTOXICOLOGY AND ENVIRONMENTAL CHEMISTRY. Book series in preparation; to be published once every two years beginning in 1998. First book published on Genetics and Ecotoxicology (1998).

PRESENTATIONS/PUBLICATIONS

Rand, G. M. Fate and Biological Effects of the Insecticide-Miticide Chlorfenapyr in Outdoor Aquatic Microcosms. Submitted to Ecotoxicology & Environmental Safety.

Rand, G.M. and Wheat, J.V. A Diluter Control System for Flow-Through Toxicity Studies with Aquatic Organisms. Submitted to Water Research.

Rand, G.M. et al. Physiological Performance Measures and Tolerance Limits for Estuarine Indicator Species in South Florida. Invited paper presented at 23rd Annual Meeting of the Society of Environmental Toxicology and Chemistry. November 2002. Salt Lake City, UT.

Carriger, J.F., Rand, G.M. et al. Probabilistic Aquatic Ecological Risk Assessment of Pesticides in the C-111 Canal System, South Florida. Paper presented at 23rd Annual Meeting of the Society of Environmental Toxicology and Chemistry. November 2002. Salt Lake City, UT. Paper in preparation.

Rand, G.M. Aquatic Risk Assessment of Adult Mosquito Control Agents. Invited paper at the Florida Keys National Marine Sanctuaries Mosquito Control workshop. Sponsored by DEP and NOAA. October 15 2002. Marathon, FL. Paper in preparation.

Rand, G.M. Overview of Ecotoxicology and Risk Assessment in South Florida Ecosystems. Invited paper at the Contaminants and Biogeochemistry Workshop for Greater Everglades Ecosystem Restoration (GEER). Sponsored by U.S.G.S. May 29 2002. Ft. Lauderdale, FL.

Rand, G.M. et al. 2003. An Automated Overlying Water-Renewal System for Sediment Toxicity Studies. Environ. Pollut. 122: 169-175.

Rand, G.M. et al. 2003. Sediment Toxicity in Central and South Florida Ecosystems: Year I. In press. Bull. Environ.Toxicol.& Chem.

Rand, G.M. et al. Sediment Toxicity in the Central and South Florida Ecosystem. Paper presented at 22nd Annual Meeting of the Society of Environmental Toxicology and Chemistry. November 2001. Baltimore, MD.

Rand, G.M. et al. Initial Hazard Assessment of South Florida Ecosystems. Paper presented at 22nd Annual Meeting of the Society of Environmental Toxicology and Chemistry. November 2001. Baltimore, MD.

Rand, G.M. and Gardinali, P. South Florida Ecosystems. Accepted for Ecotoxicology.

Pfeuffer, R.J. and Rand, G.M. South Florida Ambient Pesticide Monitoring Program. Accepted for Ecotoxicology.

Rand, G.M. et al. Sediment Toxicity in the St. Lucie River Watershed and Everglades Agricultural Area. Accepted for Ecotoxicology.

Lounsbury-Billie, M.J., Rand, G.M. et al. Mercury and Trace Metal Concentrations in Osprey Populations in Florida Bay. Paper presented at 22nd Annual Meeting of the Society of Environmental Toxicology and Chemistry. November 2001. Baltimore MD.

Coronel, L.R., Rand, G.M. et al. Atrazine Affects the Ability of Post-Larval Shrimp (*P. Vannamei*) to Resist Infection by *Vibrio harveyi*. Paper presented at 22nd Annual Meeting of the Society of Environmental Toxicology and Chemistry. November 2001. Baltimore MD.

Mahabir, S.P., Rand, G. M. et al. Effects of MTBE on soil organisms. Paper presented at 22nd Annual Meeting of the Society of Environmental Toxicology and Chemistry. November 2001. Baltimore MD.

Lee, T.A., Rand, G. M. et al. Effect of Irgarol 1051 on the Relationship between the Sea Anemone *Aiptasia pallida*, and its' Zooxanthellae Algae. Paper presented at 22nd Annual Meeting of the Society of Environmental Toxicology and Chemistry. November 2001. Baltimore MD.

Lounsbury-Billie, M.J., Rand, G.M. et al. Trace Metal Concentrations in Osprey Populations in Everglades National Park. Paper presented at Greater Everglades Ecosystem Restoration Science Conference. December 2000. Naples, FL.

Rand, G.M. et al. Assessment of Sediment Toxicity in the St. Lucie River Watershed and Everglades Agricultural Area. Paper presented at Greater Everglades Ecosystem Restoration Science Conference. December 2000. Naples, FL.

Rand, G.M. et al. Initial Hazard Assessment of Sediment Toxicity in St. Lucie River Watershed and Everglades Agricultural Area. Paper presented at 21st Annual Meeting of the Society of Environmental Toxicology. November 2000. Nashville, TN.

Rand, G. M. 2002. Hazard Assessment of Resmethrin: I. Effects and Fate in Aquatic Systems. Ecotoxicol. 11: 101-111.

Rand, G.M. 2001. Hormesis and Ecological Risk Assessment. Human and Experim. Toxicol. 20: 525-526.

- Rand, G. M. and Carriger, J. F. 2001. U.S. Environmental Law Statutes in Coastal Zone Protection. Environ. Tox. & Chem. 20: 115-121. Invited paper. Special Annual Review edition on Coastal Ecosystems.
- Rand, G. M. et al. 2001. The Use of Outdoor Freshwater Pond Microcosms: III. Responses of Phytoplankton and Periphyton to Pyridaben. Environ. Tox. 16: 96-103.
- Rand, G. M. et al. Linking Exposure, Toxicological Effects and Risk Management To Sustainable Restoration of Aquatic and Wildlife Ecosystems in South Florida. Paper presented at the 1999 Florida Bay and Adjacent Marine Systems Science Conference. November 1999. Key Largo, FL.
- Rand, G. M. Comparative Aquatic Hazard Assessment of Resmethrin. Paper presented at 20th Annual Meeting of the Society of Environmental Toxicology and Chemistry. November 1999. Philadelphia, Pa.
- Glickfield, G. J. and Rand, G. M. Modeling Exposure to Ethion and Bromacil in St. Lucie County's C-25 Canal and Indian River Lagoon. Paper presented at 20th Annual Meeting of the Society of Environmental Toxicology and Chemistry. November 1999. Philadelphia, Pa. Paper in preparation.
- Rand, G. M. et al. Fate and Effects of the Insecticide/Miticide, Pyridaben Using a Freshwater Outdoor Microcosm System. Paper presented at the 19th Annual Meeting of the Society of Environmental Toxicology and Chemistry. November 1998. Charlotte, N.C.
- Pierce, R. H., Henry, M. S. and Rand, G. M. Hazard Assessment of Mosquito Insecticides in South Florida. Paper presented at the 19th Annual Meeting of the Society of Environmental Toxicology and Chemistry. November 1998. Charlotte, N.C.
- Rand, G. M. A Summary of Workshop: Ecological Risk of Toxic Substances in Florida Ecosystems. Invited paper presented at the 19th Annual Meeting of the Society of Environmental Toxicology and Chemistry. November 1998. Charlotte, N.C.
- Rand, G. M. and Clark, J. R. 2000. Hazard/Risk Assessment of Pyridaben: I. Aquatic Toxicity and Environmental Chemistry. Ecotoxicology 9:153-164.
- Rand, G. M. and Clark, J. R. 2000. Hazard/Risk Assessment of Pyridaben: II. Use of Outdoor Aquatic Toxicity Studies and the Water Effect Ratio. Ecotoxicology 9:165-173.
- Rand, G. M. et al. 2000. The Use of Outdoor Freshwater Pond Microcosms: II. Responses of Biota to Pyridaben. Environ. Tox. & Chem. 19: 396-404.

- Rand, G. M. et al. 2000. The Use of Outdoor Freshwater Pond Microcosms: Microcosm Design and Fate of Pyridaben. *Environ.Tox. & Chem.* 19: 387-395. I.
- Rand, G. M. Fish Toxicity Studies. In *The Toxicology of Fishes*, R.T. Di Giulio and D. Hinton, Eds. Taylor and Francis Publishers, Washington, D.C. To be published in 2003.
- Rand, G. M. and Newman, J. J. 1998. The Applicability of Habitat Evaluation Methodologies in Ecological Risk Assessment. *Human and Ecological Risk Assessment*. Vol 4(4): 905-929.
- Rand, G. M. and Zeeman, M.G. 1998. Ecological Risk Assessment Approaches within the Regulatory Framework. *Human and Ecological Risk Assessment*. Vol 4(4): 853-886.
- Rand, G. M. 1996. Aquatic Toxicology: Evolution of the Science/Strengths and Limitations of Aquatic Organisms as Models for Human Health Risk Assessment. An invited paper presented in a continuing education course at the Society of Toxicology Annual Meeting, March, 1996. Anaheim, California.
- Rand, G.M. and Zeeman, M.G. 1995. TSCA/FIFRA Ecological Risk Assessment Approaches. Invited paper presented at a workshop on State of Practice of Risk Assessment in Human Health and Environmental Decision Making, Florida Center for Environmental Studies. Florida Atlantic University. December 1995. Tallahassee, Florida.
- Rand, G.M. 1995. Methods and Strategies in Ecological Risk Assessment: Implications for Risk Management. Invited paper presented at Third Annual Florida Environmental Expo. September 1995. Tampa, Florida.
- Rand, G.M. 1995. Ecological Risk Assessments: Structure and Application. An invited paper presented at the 18th Annual Conference of the Florida Association for Water Quality Control. June 1995. Naples, Florida.
- Rand, G.M. 1994. History of Aquatic Toxicology and Evolution of Field Studies in Risk Assessment. An invited paper presented at the Society of Environmental Toxicology and Chemistry Annual Meeting, November 1994. Denver, Colorado. Paper published in *Society of Environmental Toxicology and Chemistry journal* in 1995.
- Rand, G.M., P.G. Wells and L.S. McCarty. 1995. Introduction to Aquatic Toxicology. In *Aquatic Toxicology: Effects, Environmental Fate and Risk Assessment*, G.M. Rand, ed. Taylor and Francis, Washington, D.C.
- MacKay, D., L.A. Burns and G.M. Rand. 1995. Fate Modeling. In *Aquatic Toxicology: Effects, Environmental Fate and Risk Assessment*, G.M. Rand, ed. Taylor and Francis, Washington, D.C.

- Spacie, A., L.S. McCarty and G.M. Rand. 1995. Bioaccumulation and Bioavailability in Multiphase Aquatic Systems. In *Aquatic Toxicology: Effects, Environmental Fate and Risk Assessment*, G.M. Rand, ed. Taylor and Francis, Washington, D.C.
- Rand, G.M. et al. 1994. The Use of an Outdoor Aquatic Microcosm System to Assess Pesticide Stress on Aquatic Organisms. Presented at the Eighth International Congress on Pesticide Chemistry, ACS, July, 1994, Washington, D.C.
- Rand, G.M. et al. 1993. Design and Aquatic Ecology of a Freshwater Microcosm. Presented at The Society of Environmental Toxicology and Chemistry Annual Meeting, November, 1993. Houston, Texas. Invited paper for publication in book "Ecological Risk Assessment of Pesticides: Enhancing the Process" to be published in 1995 by Society of Environmental Toxicology and Chemistry.
- Rand, G.M. 1991. NATO Advanced Workshop on Biomarkers. Invited to participate. May 11-18, Texel, The Netherlands. Co-authored paper entitled Development and Validation of Biomarkers. In *Biomarkers - Research and Application in the Assessment of Environmental Health*, D.B. Peakall and L.R. Shugart, eds. NATO ASI Series. Springer-Verlag, New York, N.Y., 1991.
- Rand, G.M. 1990. Ecological Risk Assessment. An invited paper presented at the U.S.-Japan Pesticide Workshop sponsored by the National Science Foundation, September, 1990. Rockville, Maryland. Published in 1992.
- Rand, G.M. 1990. Basic Toxicological Considerations. In Controlling Chemical Hazards, R.P. Cote and P.G. Wells, eds. Allen and Unwin Publishers, England, 47-78.
- Rand, G.M. 1989. An Environmental Risk Assessment of a Pesticide: Carbofuran. In *The Risk Assessment of Environmental Hazards: A Textbook of Case Studies*, D.J. Paustenbach, ed. John Wiley & Sons, Washington, DC, 899-934.
- Rand, G.M. et al. 1988. Biological Treatment of Soil Contaminated with No. 6 Fuel Oil. A paper presented at the Society of Environmental Toxicology and Chemistry Annual Meeting, November, 1988. Arlington, Virginia.
- Rand, G.M., M.A. Palmieri and R.A. Robinson. Permethrin: Chronic Fish Toxicity and Bioavailability to Aquatic Organisms. A paper presented at the Society of Environmental Toxicology and Chemistry Annual Meeting, November, 1986. Arlington, Virginia.
- Palmieri, M.A. and G.M. Rand. Hazard Evaluation of the Herbicide, Clomazone to Aquatic Organisms and Wildlife. A paper presented at the Society of

- Environmental Toxicology and Chemistry Annual Meeting, November, 1986.
Arlington, Virginia.
- Rand, G.M. Pyrethroids and Ecological Risk Assessment. An invited paper presented at the National Academy of Sciences, March, 1986. Washington, D.C.
- Rand, G.M., D.E. Nye and G. Chester. Worker exposure to and adsorption of cypermethrin during aerial application of an "ultra low volume" formulation to cotton. A paper presented at the "Society of Toxicology 25th Annual Conference", March, 1986. New Orleans, LA.
- Rand, G.M. 1985. Behavior. In Fundamentals of Aquatic Toxicology, G.M. Rand and S.R. Petrocelli, eds. Hemisphere Publishing, New York, 221-263.
- Rand, G.M. and S.R. Petrocelli. 1985. Introduction. In Fundamentals of Aquatic Toxicology, G.M. Rand and S.R. Petrocelli, eds. Hemisphere Publishing, New York, 1-28.
- Rand, G.M., J.R. DeProspero, R.A. Robinson and M.J. Fletcher. Carbosulfan: Aquatic Toxicology. A paper presented at the "Society of Toxicology 24th Annual Conference", March, 1985. San Diego, California.
- Rand, G.M., J.R. DeProspero, R.A. Robinson and M.J. Fletcher. Carbosulfan: Avian Toxicology. A paper presented at the "Society of Toxicology 24th Annual Conference", March, 1985. San Diego, California.
- Rand, G. M. Agricultural Chemicals: Strategies and Concerns for the Environmental Chemist. An invited paper presented at the Association of Official Analytical Chemists Centennial Meeting, October 29- November 1, 1984.
- Rand, G.M., J.R. DeProspero and M.J. Fletcher. Chronic Effect of Dietary Administration of Carbofuran on Beagle Dogs. A paper presented at the "Society of Toxicology 23rd Annual Conference", March 12-16, 1984. Atlanta, Georgia.
- Rand, G.M. The Use of Behavioral Measurements to Assess Toxicant Induced Stress in Marine Organisms. Invited paper presented at the "International Symposium of Ecotoxicological Testing for the Marine Environment", September 12-14, 1983. Ghent, Belgium. Published in symposium volume. Ecotoxicological Testing for the Marine Environment Vol. 2, G. Persoone, E. Jaspers, C. Claus, eds. European Aquaculture Society, 1984.
- Rand, G.M. and J.R. DeProspero. Environmental Toxicology of Carbofuran. A Paper presented at the "Fourth Annual Meeting of the Society of Environmental Toxicology and Chemistry", November 6-9, 1983. Arlington, Virginia. Submitted to journal for publication.
- Rand, G.M., P.O. Nees, C.J. Calo, D.J. Alexander and G.C. Clark. The Effects of Inhalation Exposure to Hexachlorocyclopentadiene (Hex) on Rats and

- Monkeys. A paper presented at the 20th annual meeting of the Society of Toxicology, March 3, 1981. Boston, MA.
- Rand, G.M., P.O. Nees, C.J. Calo, D.J. Alexander and G.C. Clark. 1982. The Effects of Inhalation Exposure to Hexachlorocyclopentadiene on Rats and Monkeys. *J. Toxicol, Environm. Health* 9: 743-760.
- Rand, G. M., P. O. Nees, C. J. Calo, G. C. Clark and N. A. Edmonson. 1982. The Clara Cell: An Electron Microscopy Examination of the Terminal Bronchioles of Rats and Monkeys Following Inhalation of Hexachlorocyclopentadiene. *J. Toxicol. Environm. Health.* 10: 59-72.
- Barthalmus, G.T. and G.M. Rand. 1980. Behavioral Toxicology. In Introduction to Environmental Toxicology, F.E. Guthrie and J.J. Perry, eds. Elsevier Pub. New York.
- Rand, G.M. and G.T. Barthalmus. 1980. River Pollution. In Introduction to Environmental Toxicology, F.E. Guthrie and J.J. Perry, eds. Elsevier Pub. New York.
- Rand, G.M. 1980. Bioassays. In Introduction to Environmental Toxicology, F.E. Guthrie and J.J. Perry, eds. Elsevier Pub. New York.
- Rand, G.M. and G.T. Barthalmus. The Use of an Unsignalled Avoidance Technique to Evaluate the Effects of the Herbicide 2,4 dichlorophenoxyacetic Acid in Goldfish. A paper presented at the "Third Annual Symposium on Aquatic Toxicology", October 17, 1981. Sponsored by the American Society for Testing and Materials. Published in symposium volume. *Aquatic Toxicology*, ASTM STP707, J.G. Eaton, P.R. Parrish, and A.C. Hendricks, eds. American Society for Testing and Materials, 1980, 341-353.
- Palmer, J.B. and G.M. Rand. 1977. Trace Metal Concentrations in Two Shellfish Species of Commercial Importance. *Bull. Environm. Contamin. and Toxicol.* 18, 512-520.
- Rand, G.M. The Effect of Subacute Parathion Exposure on the Locomotor Behavior of the Bluegill Sunfish and Largemouth Bass. A paper presented at the "Symposium on Aquatic Toxicology and Hazard Evaluation", October 26, 1976. Sponsored by the American Society for Testing and Materials. Published in symposium volume. *Aquatic Toxicology and Hazard Evaluation*, ASTM STP634, F.L. Mayer and J.F. Hamelink, eds. American Society for Testing and Materials, 1977, 253-268.
- Rand, G.M. 1977. The Effect of Exposure to a Subacute Concentration of Parathion on the General Locomotor Behavior of the Goldfish. *Bull. Environm. Contamn. and Toxicol.* 18, 259-266.
- Rand, G.M., H. Kleerekoper and J. Matis. 1975. Interaction of Odour and Flow Perception and the Effects of Parathion in the Locomotor Orientation of the Goldfish, Carrassius auratus L. *Journal of Fish Biology* 7, 497-504.

EDUCATION

NIH Postdoctoral Research Fellow/ Trainee in Toxicology	November, 1977- February, 1979	North Carolina State University
Ph.D.: Biology- Environmental Toxicology	May, 1976	Texas A&M University
M.S.: Marine Biology	October, 1972	Long Island University
B.A.: Biology/Chemistry	February, 1966	Hunter College of the City Univ. of New York

LANGUAGES

Working knowledge of French and Spanish.

