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| **Anthony Q. Armstrong***Curriculum Vitae* |
| RESEARCH INTERESTS | I am environmental health scientist and leader of the Environment Risk and Energy Analysis group, Environmental Sciences Division, at the Oak Ridge National Laboratory. My work is focused on health assessment and development of computational methods in the areas of hazard exposure modeling and simulation, with an emphasis on uncertainty, risk, and decision analytics. Areas of application include quantitative chemical, biological, and radiological hazard assessment, data analytics, and environmental risk. Quantifying uncertainty and risk as well as understanding the implications of both for decision making is a recurring theme in my work.  |
| Experience | **Group Lead and Senior Research Staff, Environment Risk and Energy Analysis Group, ESD** 2019 to presentAs group lead, I work with and oversee a diverse and talented group of ORNL staff, post-docs, interns and students. Research by this group spans a wide spectrum of expertise including health science, toxicology, environmental chemistry, exposure and dose response modeling and simulation, sustainable energy economic and security analysis, and data analytic challenges applied to environmental and energy research domains. Group members lead and support interdisciplinary research teams across ORNL, the DOE complex and other federal and university entities in collaborative efforts to shape and advance respective research missions of DOE and the federal government. As a researcher, my work is typically computational in nature with a focus on hazard assessments, development of health protective guidance, uncertainty analysis, risk, and decision support. As a PI, I currently lead the Military Occupational and Environmental Health Assessment for Multiple Hazards Project for DoD and the Risk Analysis and Toxicological Decision-Making Research Project for EPA. I also significantly contribute to other research efforts within the group, the Biological and Environmental Systems Science Directorate and the National Security Sciences Directorate. **Team Lead and Senior Research Staff, Health Risk and Regulatory Analysis, Human Health Risk and Environmental Analysis Group, ESD** 2017 – 2019Research by this team focuses on exposure assessment, toxicology, dose response modeling and simulation, and computational tools to inform risk-based decisions in a health and environmental protective context. Staff and university collaborators developed enhanced vapor intrusion computational models to assess volatile chemical and radon exposures in buildings for EPA. These computational tools are incorporated into web-based environmental health assessment expert systems for use by risk assessors and stakeholders throughout the environmental health protection community of practice. Staff developed analytical toxicity models for chemical additives in foods and food packaging to support food safety assessments for FDA. Enhancements to foundational chemical specific quantitative structure analysis for predictive toxicology increased the toxicological library for food additives of interest. For DOE environmental health and safety and environmental management programs, staff and university collaborators developed enhanced Derived Concentration Standards for exposure to each of 1252 radionuclides via inhalation, ingestion, or external irradiation from submersion in contaminated air. These values are used in the design and implementation of environmental radiation protection programs at facilities throughout the DOE complex. For DoD US Army Medical Command, developed advanced quantitative chemical and biological health assessment methods and translational science for military exposure guidelines of emerging threats. Occupational and environmental exposure guidelines support risk assessments and risk management principles for military operations and missions. **Research Staff, Human Health Risk and Environmental Analysis Group, ESD**2009 – 2017Activities included serving as principle investigator, technical lead, and point of contact with sponsoring agencies including DOD and EPA. Efforts centered largely on development of computational risk methods and models for occupational and environmental health assessments.PI for DoD, Army Public Health Center, Military Exposure Guidelines for Chemicals (CMEG) and Biologicals (BMEG) projects providing analyses and development of exposure guidelines for military personnel. Our team developed exposure assessments, advanced data analytics, models, and simulations for dose response data for military relevant toxicants, and health-risk based models for situation awareness and response. Co-PI for DoD, in the analysis and development of consequence management (CM) tools for response to chemical/biological incidents. This effort provided an enhanced approach to CM including incorporation of the best tools, databases, and methods for efficient resolution of incidents in support of civilian authorities including environmental sampling strategies, fate and transport modeling, clearance levels, and decontamination technologies.Technical lead for research and development of cyanotoxin drinking water guidelines for the EPA, Office of Water. Assessed cyanotoxin occurrence in surface waters and their association with Harmful Algal Blooms, developed exposure assessment models for risk assessments, and completed exposure and risk assessments to support health advisories and drinking water guidelines.Technical lead for research and development of health risk screening criteria for radionuclides in fracking waters for the EPA, Office of Water. Developed radionuclide health risk screening tools for evaluation of exposures to radionuclides in fracking water and evaluations of treatment, disposal, or reuse of fracking waters.Technical lead to the EPA, Office of Water in the assessment of pharmaceuticals and personal care products (PPCPs) as chemicals of emerging concern. This effort developed analytical databases with a key focus on PPCPs in surface waters and drinking water sources. Analyses provided a baseline for the presence of PPCPs in US surface waters and for effectiveness of municipal treatment techniques in removal of PPCPs from drinking water.Environmental microbiologist responsible for evaluating biopesticide products for the EPA, Office of Pesticide Programs. Tasks included evaluations of biopesticides product chemistry, efficacy, toxicity, non-target organism impacts as well as environmental fate and persistence. Biopesticides also include plant incorporated protection products which are genetically engineered corn, cotton, and soybeans with express insect resistance traits. Responsible for evaluations of transgenic cotton, corn and soybean including; genetic transformations, molecular characterization, efficacy, human health and ecological impacts of transgenic plants, product durability, non-target testing, and insect resistance management plans.**Research Staff, Toxicology and Risk Analysis Group, LSD**2000 – 2009 (Lead for Risk and Regulatory Analysis Team, 2002-2007)PI for Evaluation of Toxicology, Chemistry and Environmental Fate Data on Pesticides, EPA Office of Pesticide Programs. Responsible for development of risk assessment methods and performing chemical pesticide fate and transport analyses and toxicology evaluations for ecological endpoints. Co-PI in collaboration with the University of Tennessee Food Safety Center of Excellence (UTFSCOE) on a USDA CSREES grant to investigate survivability and transmission of foodborne pathogens in the farm environment for development of pathogen risk assessments. Research provided quantitative microbial risk analysis methodologies to assess adverse impact of pathogens in foods and to enhance safety practices on the farm thus reducing the potential for food borne illness. Microbiologist evaluating antimicrobial efficacy data for the Antimicrobials Division of EPA’s Office of Pesticide Programs. Evaluated the antimicrobial effectiveness of numerous chemicals to pathogenic microorganisms (including fungi, bacteria, and viruses), which humans may contact in air, water, or on inanimate surfaces. **Research Staff, Toxicology and Risk Analysis Section, LSD**1996 – 2000Performed human health, ecological, and radiological risk assessments for the DOE, DoD and other federal agencies; developed risk-based decision analytic methods and software to aid in optimization of site characterization activities and remedial decisions; conducted cost/risk benefit analysis of treatment technologies and developed risk management approaches which address exposure risks and safety risks associated with military unique compounds and unexploded ordnances. Co-PI for the Decision Support Software Evaluation project sponsored by EPA’s Environmental Technology Verification Program, Technology Innovation Office. Designed, developed and implemented a technology evaluation program for testing the capabilities of environmental decision analysis software to perform advanced geostatistics and modeling of cost/risk/benefit factors. Newly developed GIS and visualization software packages addressed the complex uncertainties associated with natural systems and environmental cleanup decisions. Technology verification reports were produced which documented the performance of the decision support softwares evaluated by the Environmental Technology Verification Program. As a member of the Consortium for Environmental Risk Evaluation (CERE), provided human health and ecological radionuclide risk metrics for evaluating innovative soil and groundwater treatment technologies for DOE EM. Developed a technology evaluation framework for DOE to assist in selection of applicable treatment technologies and to assist in communicating environmental cleanup decisions to federal and state regulatory agencies as well as the public.**Technical Staff, Risk Analysis Section, HSRD**1990 – 1996PI for performance assessment activities for the uranium in soils technology demonstration project for DOE EM, Office of Technology Development. Technical areas included; demonstrations and evaluations of characterization and treatment technologies developed for contaminated soils; the design and application of cost/risk analyses of remediation technologies and systems as well as the quantification of exposures and health risks from contaminated media before, during and after technology implementation. Characterization and treatment technologies were studied at DOE facilities with radionuclide contaminated soils in New Jersey, New Mexico, Tennessee, Ohio and Washington.Provided risk assessment technical assistance for environmental restoration projects at DOE and DoD sites. As a member of a multidisciplinary project team, provided technical assistance for determining fate and transport of contaminants (primarily radionuclides), estimating exposure and human health risks, and conducting cost/risk analyses of remedial options. |
| Selected Publications, INVITED Presentations (2018 - present) | DocumentsE..A. Asano, F.G. Dolislager, K.L. Manning, D.J. Stewart, K.A. Noto, H.J. Ringer, C.E. Samuels, L.D. Galloway, A.Q. Armstrong, M.B. Bellamy. *Air Exchange Rate Impact on Actinon, Thoron, and Radon Activity Equilibrium Factor and Fractional Equilibrium Factor Determination in Vapor Intrusion Risk and Dose Models*. August 2019. ORNL//TM-2019/1269.- A. Armstrong, A. Watson, G. Intano. *Biological Military Exposure Guidelines for Airborne Brucella spp. Causing Brucellosis*. TBMED580-RD5-BMEG-Brucella-Air-SME Review Document, July 2019. 63 p. (DoD APHC OUO)- G. Intano, B Gutting, G. McClellan, D. Crary, (A. Armstrong, M. McAtee contributors). *Biological Military Exposure Guidelines for Inhalation Exposure to Aerosolized Staphylococcus Enterotoxin B (SEB*). TBMED580-RD6-BMEG-SEB-Air-SME Review Document, July 2019. 206 p. (DoD APHC OUO)- B. Thran, M. McAtee, G. Intano, S. Comaty, K. Ulmes, A. Watson, A. Armstrong, B. Gutting, G. McClellan, M. Coleman. *Biological Military Exposure Guideline Development Protocol*. TBMED580-RD1-BMEG-Protocol Document, June 2019. 143 p. (DoD APHC OUO)- S. Comaty, A. Armstrong, F. Dolislager, M. McAtee. *Gray Water Reuse (Nonpotable) Guidelines.* Public Health Information Report, Final Draft, December 2018. 88 p.(DoD APHC OUO)- A. Armstrong, D. Glass-Mattie, G. Intano. *Data Qualification Report for Biological Military Exposure Guidelines for Aerosolized Ricin*. TBMED580-RD7-BMEG-Ricin-Air-DQR, Final Draft, June 2019. 50 p. (DoD APHC OUO)- A. Armstrong, D. Glass-Mattie, G. Intano. *Biological Military Exposure Guidelines for Aerosolized Ricin*. TBMED580-RD7-BMEG-Ricin-Air, Final Draft, June 2019. 61 p. (DoD APHC OUO)- A.P. Watson, A.Q. Armstrong, G.H. White, B.H Thran. *Health-based ingestion exposure guidelines for Vibrio cholerae: Technical basis for water reuse applications*. Science of The Total Environment, Volumes 613–614, February 2018. 379-387. Presentations- A. Armstrong, M. McAtee, G. White, A. Morton, J. Piburn. *Personnel Time on Installation Analytics*. DoD AEC/APHC Project Review, Fort Sam Houston, TX. March 3-4, 2020. All materials OUO.- G. Intano, B Gutting, G. McClellan, D. Crary, (A. Armstrong, M. McAtee contributors). *Interim BMEGs for Inhalation Exposure to Aerosolized Staphylococcus Enterotoxin B (SE*B). Subject Matter Expert Workshop. August 28, 2019. NCI Library, Fort Detrick, MD. DoD APHC. All materials OUO.- A. Armstrong, A. Watson, G. Intano. *Interim BMEGs for Inhalation Exposure to Aerosolized Brucella spp*. Subject Matter Expert Workshop. August 15, 2019. NCI Library, Fort Detrick, MD. DoD APHC. All materials OUO.- E. Asano, A. Armstrong, F. Dolislager. *Air Exchange Rate Impact on Actinon, Thoron, and Radon Activity Equilibrium Factor and Fractional Equilibrium Factor Determination in Vapor Intrusion Risk and Dose Models*. ORAU NESLS Poster Session, August 7, 2019. - A. Armstrong. *Advanced Chemical Security Culture*. Chemical Security, Import Control and Dual-Use Chemicals Workshop, Department of State, Chemical Security Program. June 11-13, 2019. Athens Greece. All materials OUO. - A. Armstrong. *Dual-Use Chemicals and Commodities of Concern*. Chemical Security, Import Control and Dual-Use Chemicals Workshop, Department of State, Chemical Security Program. June 11-13, 2019. Athens Greece. All materials OUO.- A. Armstrong. *Communicating Chemical Security*. Chemical Security, Import Control and Dual-Use Chemicals Workshop, Department of State, Chemical Security Program. June 11-13, 2019. Athens Greece. All materials OUO.- A. Armstrong, N Turk. *Exercise on Chemical Hazards and Risks*. Chemical Security, Import Control and Dual-Use Chemicals Workshop, Department of State, Chemical Security Program. June 11-13, 2019. Athens Greece. All materials OUO.- A. Armstrong, R. Stewart, A. Morton. *Health Assessments and Geographic Data Science Briefing*. December 18, 2018. DoD APHC, Aberdeen Proving Ground, MD. - M. McAtee, G. Intano, A. Armstrong, B. Gutting. *Chemical and Biological Military**Exposure Guidelines Development*. National Academies of Sciences, Engineering, and Medicine’s Committee on Toxicology. Washington, DC. September 17, 2018. All materials OUO.- J. Charles, A. Armstrong, L. Galloway, K. Noto, F. Dolislager, M. Bellamy. *Determination of Time Period of Peak Cancer Risk from Exposure to Pure Isotopes Decaying and Ingrowing Progeny*. ORAU NESLS Poster Session, August 2018. - A. Armstrong, A. Watson, G. Intano. *Airborne Brucella spp. Data Quality for BME*Gs. Subject Matter Expert Workshop. June 5, 2018. NCI Library, Fort Detrick, MD. DoD APHC. All materials OUO.- A. Armstrong, F. Dolislager, L. Galloway, D. Stewart. *Risk Assessment Information System and Toxicity Metadata*. March 7, 2018. Aberdeen Proving Ground, MD. DoD APHC. All materials OUO.  |

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| PROFESSIONAl AFFILIATIONS | American Society of MicrobiologyThe Society for Risk AnalysisSociety for Environmental Toxicology and ChemistryWorld Health Organization Chemical Risk Assessment Network |
| Education | M.S. Microbiology, University of Georgia, 1989B.S Biology/Microbiology, Tennessee Technological University, 1986 |
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