**Research Experiences for Undergraduate and Master's Students**

**Duke University Superfund Research Center**

The **Superfund Research Program (SRP)** is a network of university grants funded by the National Institute of Environmental Health Sciences (NIEHS) that are designed to seek solutions to the complex health and environmental issues associated with toxic chemicals found at the nation's hazardous waste sites. The research conducted by the SRP is a coordinated effort with the Environmental Protection Agency, which is the federal entity charged with cleaning up the worst hazardous waste sites in the country. **The central goal of Duke's NIEHS-funded Superfund Research Center (SRC) is to determine the mechanisms and consequences of the heightened vulnerability of developing organisms to toxicant effects, and effective strategies for remediation of contaminated sites.**

Full-time summer research internship opportunities for undergraduate and master's students (Biology, Chemistry, Psychology, Neuroscience, Engineering, and Environmental Sciences) are offered in Center projects and cores:

**Project 1** (Theodore Slotkin, PI) - ***Developmental Neurotoxicants: Sensitization, Consequences and Mechanisms*:** This project focuses on exposures that sensitize the developing rat brain to damage caused by selected pesticides, hydrocarbons and flame retardants, and on the synaptic and cellular mechanisms underlying developmental damage. ***(Not currently accepting applicants.)***

**Project 2** (Heather Stapleton and Lee Ferguson, PIs) - ***Thyroid Metabolism Disruption in Toxicant-Induced Developmental Impairment*:** This project examines the effects of early life exposure to chemical contaminants, particularly those used as flame retardants, on the thyroid system, and its consequences on development. Trainees will learn about the use of the zebrafish model and several chemical and biochemical methods to address these questions.

**Project 3** (Richard Di Giulio, David Hinton, and Joel Meyer, PIs) - ***Developmental PAH Exposures in Fish: Mechanisms of Toxicity, Adaptation and Later Life Consequences*:** This project explores 1) the developmental effects of polycyclic aromatic hydrocarbons (PAHs) in the estuarine killifish (*Fundulus heteroclitus*), with emphasis on the "cost" issue, that is, how early life exposures affects physiology and behavior later in life; studies include a real world population of killifish that over many generations has developed resistance to the toxic effects of PAHs, including perturbed heart development and cancer, and 2) mitochondria dysfunction resulting from mitochondrial DNA damage, such as that from PAH exposures; opportunities for learning a number of molecular, biochemical, imaging and behavioral approaches are available.

**Project 4** (Mark Wiesner, Claudia Gunsch and Helen Hsu-Kim, PIs) - ***Metal-based Nanoparticles for Groundwater and Surface Water Remediation: Limitations, Concerns, Synergies and Antagonistic Effects in Bioremediation***: This project's investigations center on nanoparticle-based strategies for the remediation of sediments contaminated with PAHs, OPs, or PBDEs. Zero-valent iron (ZVI) and titanium dioxide ($TiO_2$) nanoparticles are being considered as remediation catalysts to complement natural attenuation by indigenous microorganisms and as possible contaminants in their own right. Summer trainees will participate in the inquiry into interactive effects of nanomaterials on contaminant biodegradation and microbial community dynamics.

**Neural and Behavioral Toxicity Assessment (NBTA) Core** (Edward Levin and Theodore Slotkin, PIs): This core supports the Center's projects by providing information concerning the cellular and neurobehavioral consequences of toxicant exposures. We evaluate neurotoxicant actions using *in vitro* cell-based screening as well as *in vivo* models using rats, zebrafish and killifish. With the *in vitro* studies students will learn about the targeting of cell replication and loss, cell growth and neurite formation, oxidative stress and cytotoxicity, and differentiation into specific neurotransmitter phenotypes. With the *in vivo* studies students will learn about the neurobehavioral characterization of sensorimotor response, cognitive function, and emotional function affected by developmental toxicant exposures in rats, zebrafish, and killifish. This core connects mechanistic studies to functional consequences.

**Analytical Chemistry Core** (Lee Ferguson and Heather Stapleton, PIs): This core measures various organic chemicals of interest to the Center in several matrices such as aqueous solutions and tissues. Through the use of advanced mass spectrometry techniques the core is able to identify contaminant degradation products and/or metabolites. The core is equipped for high through-put extraction and analysis of samples for trace organic chemicals using a combination of gas chromatography mass spectrometry (GC/MS) and liquid chromatography tandem mass spectrometry (LC/MS-MS) techniques. Students affiliated with this core will learn analytical techniques central to modern environmental chemistry.

**Research Translation Core** (Charlotte Clark, PI): This core delivers the Center's research results to critical members of the scientific, governmental, and lay community. Good policy outcomes require effective communication of scientific research. Students affiliated with this core will support research translation projects and activities in order to effectively communicate research findings of the Program to scientists, policy-makers, and interested/affected community stakeholders. Students may have the opportunity to partner with a local organization to address relevant national or local issues by translating Duke Superfund research into policy-related materials. Summer trainees will also have the opportunity to participate in Center events and programs focusing on environmental/science education and environmental justice.

This year we are offering six positions. These positions are open to students currently enrolled in a four year postsecondary institution either as an undergraduate or master's student. All summer trainees will be paid a competitive hourly wage and are expected to work full-time and participate in training for a **maximum** of 35 hours per week (start and end dates are flexible between mid-May through mid-August). Students will have ample opportunity to visit other Superfund Center labs located on Duke's campus. In addition, students will participate in weekly research discussions, chalk talks, lab meetings, seminars, and workshops. Students will be asked to maintain a weekly research blog documenting their experiences.

Applicants should email a cover letter explaining their educational background and interest in research and specifying the project(s) and/or PIs of interest along with a resume addressed to:

Dr. Edward Levin
edlevin@duke.edu
Director of Training
**cc: Savannah Volkoff, savannah.volkoff@duke.edu
Superfund Research Center
Box 90328
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**The deadline for application submissions is March 3, 2014.**