Grants Awarded Report

From: 9/1/07 to 9/30/07

Proposal No: 23200506

Principal Investigator: James Layzer, Cooperative Fisheries Unit

Co-PI's:

Support Personnel:

Project Title: Development and Testing of a Protocol for Monitoring Mussels

Activation Amount: $17,513.00

Agency: U. S. Geological Survey

Abstract:

The objectives of this study include: 1) determine density and relative abundance of freshwater mussel species in selected areas of the Green River; 2) detect presence of the endangered Cyprogenia stegaria, and maximize the likelihood of detecting rare species; 3) estimate species richness, including number of species present but not found; and 4) determine if recruitment is occurring.

To determine the density and relative abundance of species, a systematic sampling design with three random starts is being used at 4 shoals located in the Green River within Mammoth Cave National Park, KY. These four shoals have the greatest amount of mussel habitat, high densities of mussels, and one or more endangered species are present. Additionally, two surveys of muskrat middens are being conducted along both the entire length of the Green River within MACA. At all middens, GPS coordinates are being taken, and all unionid shells collected are being identified and measured. Opportunistic searches by snorkeling and wading will also be made throughout the park to generate additional species presence/absence data. More intensive searches will be made on six shoals in the free-flowing section of river to increase the likelihood of detecting rare species. Species richness will be estimated using capture-recapture of species methods. These methods use independent species lists generated at different times, different locations, multiple sampling methods, or different collectors to estimate the number species present including those that have not been observed. Thus, potentially each data set (quadrat collections, midden surveys, and snorkel/wading surveys) collected in this study and some appropriate combinations could be used to estimate species richness for some locations.

Proposal No: 30200506

Principal Investigator: Jeffery Roberts, History

Co-PI's: Michael Birdwell, History

Support Personnel: Suellen Alfred, Curriculum and Instruction

Project Title: Cumberland Plateau Consortium Teaching American History

Activation Amount: $3,600.00

Agency: White County Board of Education via U. S. Dept. of Education

Abstract:

The Cumberland Plateau Consortium (CPC) includes school districts in Anderson, Bledsoe, Campbell, Cumberland, Putnam, Fentress, Marion, Meigs, Morgan, Pickett, Rhea, Scott, Sequatchie, Van Buren and White counties, all of them rural districts with limited resources. The CPC Project Design has three main goals: (1) to increase teachers' knowledge of history content; (2) to increase teachers' use of primary materials, local history resources, and technology in history instruction; and (3) to increase students' understanding of and skill level in American history. The centerpiece of the Project Design is a series of eight, one-week summer institutes over a three-year period. Each institute will immerse teachers in the content and teaching of American history in correspondence with the historical eras outlined in the 2001 Tennessee state curriculum framework. Academic year activities include mini-institutes offered in the CPC region, and annual workshops on the National History Day competition.

Proposal No: 35200708

Principal Investigator: Martha Wells, Water Center

Co-PI's:

Support Personnel:

Project Title: Endocrine Disruption Studies

Activation Amount: $3,736.00

Agency: U. S. Geological Survey via West Virginia WSC

Abstract:

The principal investigator, Dr. Martha J.M. Wells, is conducing ongoing research on assessment of the occurrence of chemicals causing endocrine disruption in fish in the South Branch of the Potomac River. The objective of the research is to ascertain the chemical(s) that are implicated in the endocrine disruption of reproductive function in fishes, particularly smallmouth bass, collected from sites located within the South Branch of the Potomac River drainage. In this project (Proposal No. 35200708), eight fish (male, smallmouth bass) were analyzed for total mercury, methyl mercury, and barium content.

Proposal No: 38200708

Principal Investigator: Faisal Hossain, Civil and Environmental Engineering

Co-PI's:

Support Personnel:

Project Title: Validating Prototype Global Precipitation Measurement Data Product in the SERVIR System

Activation Amount: $30,000.00

Agency: University of Mississippi (via NASA)

Abstract:

Proposal No: 42200708

Principal Investigator: Martha Wells, Water Center

Co-PI's:

Support Personnel:

Project Title: Evaluating Disinfectant By-Product Formation Potential in Source Water

Activation Amount: $3,000.00

Agency: Barge, Waggoner, Sumner & Cannon, Inc.

Abstract:

The objective of this research was to evaluate the potential for formation of disinfectant by-products in selected raw and treated drinking water source samples from Bristol/Bluff City, TN. Principal Investigator (PI), Martha J.M. Wells, professor of chemistry with the Center for Management, Utilization, and Protection of Water Resources, at Tennessee Technological University (TTU) in conjunction with a student and professional analytical support staff of the Water Center Environmental Quality Laboratory, implemented this project. Analyses were performed in accordance with procedures supported by the Environmental Protection Agency, Standard Methods, or techniques developed by the PI, as appropriate. Sampled were tested for the parameters total organic carbon (TOC), dissolved organic carbon (DOC), disinfectant by-product formation potential, 3-D fluorescence, and an ultraviolet (UV) absorbance scan. A total of 4 samples were processed for analysis.

Proposal No: 54200708
Principal Investigator: Kevin Liska, Business Media Center
Co-PI's:

Support Personnel: Curtis Armstrong, Decision Sciences and Management

Project Title: TBR-Developing and Marketing Web Delivery of Annual Perkins Reports

Activation Amount: $30,000.00
Agency: Tennessee Board of Regents
Abstract:

Proposal No: 57200506

Principal Investigator: Benjamin Mohr, Civil and Environmental Engineering

Co-PI's:

Support Personnel:

Project Title: Transport Kinetics of Internal Curing Water in High Performance Concretes

Activation Amount: $70,754.00

Agency: National Science Foundation

Abstract:

High performance concretes are increasingly used in construction due to increased performance demands and infrastructure growth in more aggressive environments. However, the nature of these materials (i.e., low water-to-cementitious materials ratio and refined pore structure) can lead to early age shrinking cracking. Thus, the durability of high performances concretes can be significantly compromised. Internal curing of high performance concretes has the potential to eliminate early age cracking due to self-desiccation and improve long-term durability. Internal curing through the incorporation of water absorbent materials in a cementitious matrix has been shown to minimize early age shrinking due to self-desiccation (i.e., autogenous shrinkage). Proposed internal curing materials include saturated lightweight aggregates, super absorbent polymers, and wood-derived materials. However, there has not been a systematic examination of the mechanisms of internal curing and the relative effectiveness of the various internal curing materials. A comprehensive research program is necessary to fully understand the effects of internal curing on cement-based material performance. Thus, the objectives of this research program are: 1) to elucidate the mechanisms of internal curing through a systematic examination of the moisture transport through a high performance cementitious matrix; 2) to identify those materials that are most effective and economical for large scale use in high performance concretes; and 3) to assess the short- and long-term effects of internal curing materials on the workability and flowability, strength, and durability of high performance concretes. Novel in situ microstructural characterization techniques will be applied to quantitatively analyze and map the movement of moisture from water entrainment sites through a hydrating cement paste. These techniques, which are extremely sensitive to water, include Fourier Transform Infrared (FTIR) spectroscopy, Raman spectroscopy, 1H Nuclear Magnetic Resonance (NMR), and 1H NMR Imaging (MRI). This research program is expected to improve fundamental understanding of both the moisture transport kinetics through a cementitious matrix and the structural performance effects resulting from the incorporation of internal curing materials. The experimental results obtained from these results will be used to improve upon existing computational models to improve the prediction of internal curing performance.

Proposal No: 58200708

Principal Investigator: Homer Kemp, English

Co-PI's:

Support Personnel: Calvin Dickinson,

Project Title: THC Computerization Project-2007-08

Activation Amount: $15,000.00

Agency: Tennessee Historical Commission

Abstract:

This project is a continuation of a more than 20 year project designed to build a database of historic preservation information in the state of Tennessee. For many years, various grant projects have conducted surveys county by county which recorded information on structures eligible simply age for nomination to the National Register of Historic Places. The computerization project has been entering the data into a database program which is part of a larger database which is used in a natural environment and build environment impact studies used in such areas as highway construction decisions. The database also serves as an important research tool.

Proposal No: 67200405

Principal Investigator: Joseph Biernacki, Chemical Engineering

Co-PI's:

Support Personnel:

Project Title: Multi-Scale Kinetics-Based Model for Predicting Mechanical Property Development of Concrete Containing Supplementary Cementitious Materials

Activation Amount: $43,650.00

Agency: University of Michigan Ann Arbor via NSF

Abstract:

Multi-scale kinetics-based model for predicting mechanical properties development of concrete containing supplementary cementitious materials is a collaboration between the University of Michigan and Tennessee Technological University. The objective of the project is to develop (1) a new multi-scale kinetic-based mechanistic model for predicting early-age strength development for varying temperature-time histories, and (2) a similar model for predicting early-age stresses due to thermal and shrinkage gradients. The cementitious systems to be investigated are binary blends of slag-cement, which is the basis for further work. The model will be expanded to incorporate an additional third component consisting of flyash (C/F) or alkali-based activator. Binary and ternary cements consisting of ground granulated blast furnace slag (GGBFS) have been found to develop improved long-term durability and strength. These blends, typically called slag-cements, are now widely used in practice. Slag-cements however are more temperature sensitive than regular OPC's (ordinary Portland cement). This is especially a concern for construction at low temperatures and in the presence of fly ash as the third component since fly ashes are less reactive than slag. For massive sections a major benefit of using slag-cement is the lower heat of hydration at early ages (typically the first seven days) and improved thermal crack resistance as compared to OPC concretes of same current content. The major intellectual contribution of this proposed research is the development of a multi-scale kinetics-based mechanistic model for predicting the early-age strength and stresses from thermal and drying shrinkage gradients of concrete containing supplementary cementitious materials (GGBFS and fly ash). This study will link hydration kinetics of the cementitious system to the macro-scale mechanical behavior of concrete, something that has only been done on a lumped parameter basis using maturity methods in the past. The multi-scale approach is expected to provide insights into the design of binary and ternary cement-systems, whereas conventional heuristic macro-scale models can, at best, predict the behavior of a narrowly defined system. A significant broader impact on students is expected. The proposed collaboration will offer interdisciplinary opportunities that could not otherwise be possible.

Proposal No: 89200607

Principal Investigator: Kevin Liska, Business Media Center

Co-PI's:

Support Personnel: Julie Brewer, Business Media Center

Project Title: Tennessee Seat Belt Education Campaign

Activation Amount: $49,996.00

Agency: Tennessee Road Builders Association (via TDOT)

Abstract:

Tennessee Tech's Business Media Center is developing, designing, and testing marketing materials for the full scale launch of a state-wide child seat belt education campaign conducted by the Tennessee Road Builders Association. Included in this project will be the development of strategic and tactical marketing plans to facilitate the implementation of this work.

Proposal No: 96200506

Principal Investigator: Douglas Talbert, Computer Science

Co-PI's: Michael Rogers, Computer Science

Support Personnel: Jeremy Ey, Computer Science; Sheikh Ghadfoor, Computer Science

Project Title: VEHI Subcontract with Vanderbilt

Activation Amount: $113,767.00

Agency: Vanderbilt University (via AHRQ)

Abstract:

In this project, we will work with a team at Vanderbilt University to make steps toward enabling several of the Memphis-area hospitals to share clinical data in support of patient care through the establishment of a Regional Health Information Organization (RHIO). We will focus on developing the tools and techniques to evaluate the patient matching components of the system and on assisting in the design of a distributed architecture that will be as consistent as possible with the developing national guidelines. More specifically, we are developing a gold standard data set for use in evaluation and a toolkit that uses this data set to help us, in partnership with the team at Vanderbilt, to evaluate the tools and techniques that we develop, and we will be reviewing the recommended architecture standard from Markle and the Connecting Health initiative to determine how the technical architecture for Memphis RHIO needs to be structured to enable interoperability with other RHIOs.

Proposal No: 110200607

Principal Investigator: Wenzhong Gao, Energy Center

Co-PI's: Joseph Ojo, Electrical and Computer Engineering

Support Personnel:

Project Title: MRI: Acquisition of a Real Time Digital Simulator for Power and Energy Systems Research and Education

Activation Amount: $117,650.00

Agency: National Science Foundation

Abstract:

The Real-Time Digital Simulator is a unique integration of hardware and software for performing simulation of power systems with external hardware in the simulation loop. The research activities to be conducted with the simulator will advance science and technology and enable our students to grasp the physics behind power system synamic phenomenon. For example, real time modeling and simulation can help identify the root causes of fast voltage collapse and design effective countermeasures for improving power system reliability. Additionally, the simulator provides rapid prototyping capability for developing new control algorithms for renewable and distributed energy systems. This instrument will be used as a platform for integrated hands-on research training/education for undergraduate and graduate students in the areas of power system modeling and simulation, protective relaying, power electronics and controls, etc. The simulator will complement on-going research and education activities for power and energy systems at Tennessee Technological University. The simulator will positively impact our research and educational outcomes and benefit several other local organizations. Many faculty members, students and underrepresented groups including women will have access to the high-tech state-of-the-art instrument. Further, the simulator will foster a good collaboration with faculty and students at Tennessee State University, a member of Historically Black Colleges and Universities. Effective plans such as free training workshops are devised to facilitate broader accessibility of the simulator. On a broader sense, the proposed research and training activities will contribute to the power system security and benefit our national agenda of power grid modernization in the wake of several recent major blackouts.

Proposal No: 134200607

Principal Investigator: Thomas Willis, Curriculum and Instruction

Co-PI's:

Support Personnel:

Project Title: TTU Base-TN Teaching Program 2007-08

Activation Amount: $74,625.00

Agency: Tennessee Department of Education

Abstract:

Become A Special Educator in TN Teaching Program provides financial support for persons who meet eligibility criteria and desire to earn an initial Tennessee licensure in special education or endorsement in special education. Support involves a commitment to teach in a Tennessee public school two years for each academic year of financial support received, servicing students with disabilities ages birth through 21. Financial support will be in the form of tuition remission for either part-time or full-time study to professional personnel who desire to work in programs for the education of children with disabilities. Participation is limited to post-baccalaureate candidates admitted to teacher education programs (or eligible to be admitted and have provided written intent to seek admission) in approved Tennessee colleges and universities. Educational assistants with at least two years of transferable college credit who are currently employed by a Tennessee public school and service students with disabilities ages birth through 21 are eligible. Tennessee Technological University will maintain a recruitment program to enroll ten or more individuals who are either educational assistants in public Tennessee special education classrooms serving students with disabilities who have two years or more of transferable college credit or post-baccalaureate students with a degree other than special education in coursework leading to special education licensure. TTU will maintain selection procedures and protocols and empanel a selection committee to review and make decisions about eligible applicants. Selected participants will be monitored and academic counseling sessions with all participating students will be held to determine the coursework needed and to help facilitate successful completion of the program leading to special education licensure and then employment in Tennessee public school classrooms.

Proposal No: 135200607

Principal Investigator: Thomas Willis, Curriculum and Instruction

Co-PI's:

Support Personnel: Helen Dainty, Curriculum and Instruction; Rhonda Folio, Curriculum and Instruction; Michael Mayton, Curriculum and Instruction

Project Title: TDE Special Education Institute - Strand I 2007-08

Activation Amount: $187,934.00

Agency: Tennessee Department of Education

Abstract:

Proposal No: 136200607

Principal Investigator: Melinda Swafford, Human Ecology

Co-PI's:

Support Personnel:

Project Title: TDE Special Education Institute-Strand II 2007-08

Activation Amount: $58,971.00

Agency: Tennessee Department of Education

Abstract:

Proposal No: 143200506

Principal Investigator: Glen Johnson, Mechanical Engineering

Co-PI's: Kenneth Currie, Manufacturing Center

Support Personnel: Jiahong Zhu, Mechanical Engineering; Venkat Subramanian, Chemical Engineering; Wenzhong Gao, Energy Center

Project Title: Advanced Portable Power Institute

Activation Amount: $850,000.00

Agency: U. S. Army Communications Electronics Command

Abstract:

There is an urgent need for soldier power systems both for direct power applications and battery charging, and for advancements in power sources at 2 kW and less. These power systems may need to be man-carried significant distances, and mission scenarios may not allow for frequent re-supply. The power sources may also be operated close to the front battle line, where excess noise or other signatures could not be tolerated. As a result, these power systems must be small, lightweight, energy dense, and operate with low signatures. In response to this need, the US. Army has issued several generic Operational Requirements Documents (ORDs) describing basic requirements for soldier power systems and other low power requirements. These ORDs do not require fuel cells or related technologies. However, fuel cells are one of the candidate technologies that may be suitable for these power needs. As generic ORDS, the requirements they contain are not sufficient by themselves to quantify individual power solutions. Providing fuel for the fuel cell is a very challenging problem, and often limits the overall power system specific energy to less than that of batteries. Other aspects of fuel cell technology also need advancement to realize the ultimate potential of the technological approach. The technology defined in this contractual action responds to the ORDs by determining the applicability of a variety of approaches relevant to operating or augmenting small fuel cells to meet Army needs, with some emphasis on alternative application paths for the technologies proposed. The US Army Communications-Electronics Command RD&E Center (CERDEC), Command and Control Directorate, Army Power Division, Power Technology Branch, Fort Belvoir, VA is currently directing Phase 1 of the Advanced Portable Power Institute (APPI) which is a synergistic partnership led by Tennessee Technological University (TTU), with Vanderbilt University (VU), and the International Technology Center (ITC) as contributing members and partners. Tennessee Tech's contributions will be primarily in the areas of fuel cells and batteries, including emphasis on issues related to use of JP8 in portable power applications. Vanderbilt will provide development of novel, high power density, portable mechanical and electrical devices. International Technology Center will advance microfabricated SiGe and Si Ge Superlattices for Thermoelectric Power Generation. Phase 1 is a 16-month effort to conduct advanced research and development efforts to provide advances in fuel cell and related potential ancillary component and system technologies. The mission of the APPI is to develop a range of advanced power generation and delivery concepts to support soldiers on site in battlefield and other remote locations.

Proposal No: 171200607

Principal Investigator: Martha Wells, Water Center

Co-PI's:

Support Personnel:

Project Title: Evaluating Disinfectant By-Product Formation Potential in Source Water

Activation Amount: $525.00

Agency: Barge, Waggoner, Sumner & Cannon, Inc.

Abstract:

The objective of this research was to evaluate the potential for formation of disinfectant by-products in selected raw and treated drinking water source samples from Sewanee, TN. Principal Investigator (PI), Martha J.M. Wells, professor of chemistry with the Center for Management, Utilization, and Protection of Water Resources, at Tennessee Technological University (TTU) in conjunction with a student and professional analytical support staff of the Water Center Environmental Quality Laboratory, implemented this project. Analyses were performed in accordance with procedures supported by the Environmental Protection Agency, Standard Methods, or techniques developed by the PI, as appropriate. Sampled were tested for the parameters total organic carbon (TOC), dissolved organic carbon (DOC), disinfectant by-product formation potential, 3-D fluorescence, and an ultraviolet (UV) absorbance scan. A total of 8 samples (4 each sampled in two seasons) were processed for analysis.

Proposal No: 178200607

Principal Investigator: Kim Stearman, Water Center

Co-PI's: Billy Greene, Agriculture; James Baier, Agriculture; Janice Branson, Agriculture; Jed Young, Agriculture; Michael Best, Agriculture

Support Personnel: Randy Dodson, Agriculture; Wade Faw, Agriculture

Project Title: Waters Organic Farm Startup

Activation Amount: $187,690.00

Agency: Tennessee Department of Agriculture

Abstract: