Grants Awarded Report

From: 1/1/09 to 1/31/09

Project Title: Developing K-5 Teachers' Mathematics Knowledge for Teaching (Math Partnership)

Activation Amount: $566,802.00

Agency: Tennessee Department of Education

Personnel:

PI - Holly Anthony, Curriculum and Instruction

Senior Personnel - David D. Smith, Mathematics

Senior Personnel - Jane Baker, Curriculum and Instruction

Senior Personnel - Margaret Phelps, STEM Center

Senior Personnel - Wendy Smith, Mathematics

Abstract:

Grants Awarded Report

From: 1/1/09 to 1/31/09

Project Title: Comprehensive Analysis and Benchmarking of Virtual I/O for HPC

Activation Amount: $15,000.00

Agency: Oak Ridge National Laboratory

Personnel:

PI - Xubin He, Electrical and Computer Engineering

Abstract:

System-level virtualization is commonly perceived to suffer from substantial performance shortcomings, e.g., high virtualized I/O overheads and low I/O scalability; thus, preventing it from the widespread adoption among the HPC community. To address the virtual I/O performance issue, full-virtualization (the kennel-based virtual machine (KVM and the VMWare) and para-virtualization (Xen) have adopted a different approach to enhance their respective virtual I/O models. However, the virtual I/O performance improvements of KVM and Xen have been focusing on server-based applications. There is no quantitative or/and qualitative study on how well KVM and XEN performs in the HPC, especially for those IO-intensive HPC applications. This project investigates the performance and architectural problems resulting from virtualized IO in both Xen and KVM for HPC. We will focus on virtual I/O in both diskfull and diskless configurations. We will conduct a rigorous series of tests and analyze the results collected from benchmarks, traces, and system profiles. These tests will be performed in a systematic and reproducible way by creating a standard framework in which results from a myriad of benchmarking and profiling applications may be collected, aggregated, and parsed in a flexible, yet meaningful way.

Grants Awarded Report

From: 1/1/09 to 1/31/09

Project Title: Benthic Macroinvertebrate Assessment Associated with Brook Trout Restoration of Lynn Camp Prong, GSM

Activation Amount: $24,075.00

Agency: Great Smokey Mountains National Park

Personnel:

PI - Bradford Cook, Biology

Abstract:

The objective of this work is to collect aquatic macroinvertebrate samples from a statistically valid number of sites to characterize the community prior to treatment with antimycin in 2008. Samples are to be collected quarterly. Tasks associated with this project include: 1) measure physical macro-habitat features of each site-these measurements will delineate pool, riffle, glide, cascade and run habitat; measurements of width and depth will be taken for each unit; 2) substrate composition will be determined; 3) benthic macroinvertebrate communities will be sampled quarterly and identified to the lowest taxonomic level possible-if necessary, taxa that cannot be identified to the appropriate taxonomic level will be sent to an expert for that taxonomic group identification; and 4) each sample will be sorted and sub-sampled to approximately 200 organisms. Tennessee Department of Environment and Conservation protocols for sampling benthic macroinvertebrates and appropriate quantitative techniques (i.e., modified Hester Dendy samplers and drift nets) will be used to sample and assess the benthic macroinvertebrate community at each site. Sample analyses will include the Tennessee Department of Environment and Conservation protocols for analyses of benthic macroinvertebrates and compared to metrics from reference streams.

Grants Awarded Report

From: 1/1/09 to 1/31/09

Project Title: ITQ-Inspiring the (2009-10) TN Mathematics Standards in Grades 9-12: Focus on Mathematical Processes

Activation Amount: $73,372.00

Agency: Tennessee Higher Education Commission

Personnel:

PI - Holly Anthony, Curriculum and Instruction

Senior Personnel - Andrew Hetzel, Mathematics

Senior Personnel - David D. Smith, Mathematics

Senior Personnel - Shelly Forgey, Mathematics

Abstract:

Grants Awarded Report

From: 1/1/09 to 1/31/09

Project Title: ITQ-Planting Inquiry-Based Lesson in High School Biology Students

Activation Amount: $39,642.00

Agency: Tennessee Higher Education Commission

Personnel:

PI - Christy Carter, Biology

Senior Personnel - Barbara Goodson, Biology

Senior Personnel - Suellen Alfred, Curriculum and Instruction

Senior Personnel - Susan Gore, Curriculum and Instruction

Abstract:

Grants Awarded Report

From: 1/1/09 to 1/31/09

Project Title: High Power CsH2 PO4-BITIVOX Membrane Fuel Cells for Military Applications

Activation Amount: $51,601.00

Agency: Department of Defense (via TN DEPSCoR)

Personnel:

PI - Cynthia Rice-York, Manufacturing Center

Support Personnel - Chunsheng Wang, Manufacturing Center

Support Personnel - Dalton York,

Abstract:

Proton exchange membrane fuel cells (PEMFCs) are primary candidate power sources to meet the military requirements of 'digitization' of the battlefield and 'Silent Watch' operation because of their silent and high energy density characteristics. PEMFC technologies are reasonably mature, and are beginning to move from the labs to end users. However, current PEMFC can not meet the Army's requirements due to their complex thermal and water management system, stringent hydrogen purity (low CO tolerance), high cost, and lack of robustness. The objective of the proposed research is to overcome these barriers through the development of a novel high power oxide ion and proton co-ion conducting fuel cell with intrinsic energy storage. In this fuel cell, the oxygen ionic conducting Bi4V2(1-x)Ti2xO(11-3x) (abbreviated as BITIVOX)-reinforced solid-acid CsH2PO4 is used as an electrolyte, and metal (Ni, Mn, Au or Cu) implanted BITIVOX as a catalyst. Bi4Ti0.2V1.8O10.7 has the highest reported low-temperature oxide ionic conductivity of ~10-2 S/cm at 250oC, which is almost the same as the proton conductivity of CsH2PO4 at the same temperature. A fuel cell using a co-ion conducting BITIVOX-CsH2PO4 membrane, operating at a temperature of 250oC, will combine the advantages of both the solid oxide fuel cell (SOFC) and PEMFC, and complement existing proton and oxide-ion fuel cell systems. In addition to the benefits resulting from a high operation temperature, (i.e. high CO tolerance and electrochemical reaction and diffusion rate, and simpler heat and water management), methanol and CO in reformate gas can be more efficiently and directly oxidized by the oxide ion generated either by the electrochemical reduction of dioxygen at the cathode, and subsequently moved through the BITIVOX particle (or fibers) channels to the anode, or directly by the exchange of bleeding O2 into the oxide ion on implanted BITIVOX at the anode. Using methanol and reformate gas to replace pure hydrogen, and using metal implanted BITIVOX instead of Pt catalyst, will greatly decrease the cost of PEMFCs. The low mechanical durability of the high temperature superplastic/superprotonic phase of CsH2PO4 will be dramatically enhanced by the BITIVOX particles or fibers. Water produced at both the anode and cathode sides due to its oxide and proton co-ion conduction of the BITIVOX-CsH2PO4 membrane will enhance the chemical stability of the CsH2PO4 in composite. The unique idea of electrochemical oxidation of CO and methanol at the anode by oxide ion transferred from the cathode via oxide-ion-conducting ceramics and/or exchanged from bleeding O2 has opened a window for the development of a new generation of robust power systems. The internal fuel cell/supercapacitor hybrid power sources formed by introducing the energy storage elements BaCe0.95Nd0.05O3-□ into the anode and MnOx into the cathode of the BITIVOX-CsH2PO4 fuel cell can satisfy the requirement for robustness and instantaneous peak power demands for military applications.

Grants Awarded Report

From: 1/1/09 to 1/31/09

Project Title: Development of Morphology Relationships and the Establishment of Geomorphic Reference Reaches for the Nashville Basin Physiographic Provinces

Activation Amount: $51,328.00

Agency: Tennessee Stream Mitigation Program

Personnel:

PI - Vincent Neary, Civil and Environmental Engineering

Abstract:

Grants Awarded Report

From: 1/1/09 to 1/31/09

Project Title: Evaluating Water Pretreatment for Removal of Atrazine and Organic Matter with Supporting Analyses

Activation Amount: $68,000.00

Agency: CDM, Inc.

Personnel:

PI - Martha Wells, Water Center

Abstract:

Grants Awarded Report

From: 1/1/09 to 1/31/09

Project Title: CHASCo Graduate Assistant Funding Grant

Activation Amount: $2,822.00

Agency: Tennessee Independent Colleges and Universities Association (TICUA)

Personnel:

PI - Christopher Edwards, Counseling Center

Abstract:

Grants Awarded Report

From: 1/1/09 to 1/31/09

Project Title: Monitoring the Hydrology and Selected Plant Communities at the Hatchie River Wetland Mitigation Bank

Activation Amount: $16,116.00

Agency: Tennessee Wildlife Resources Foundation

Personnel:

Co-PI - Kenneth Morgan, Biology

PI - Thomas Roberts, Biology

Abstract:

The Tennessee Wildlife Resources Foundation (TWRF) is in the process of establishing the Hatchie River Wetland Mitigation Bank in Haywood County, Tennessee. The Bank will provided compensatory mitigation for future unavoidable wetland impacts permitted through Sections 401/404 of the Clean Water Act. Development of such a wetland mitigation bank involves the off-site creation, restoration, and/or enhancement of wetlands to compensate for unavoidable adverse wetland impacts associated with future development. The objective of this project is to monitor the hydrologic regime and plant community development of the bank site to determine if it meets the criteria specified for being considered a jurisdictional wetland. Further, data on soils, hydrology, and vegetation will enable agencies to determine if the project is meeting the performance standards stated in the design documents.

Grants Awarded Report

From: 1/1/09 to 1/31/09

Project Title: College of Engineering Equipment Grant Fund 2009-10

Activation Amount: $33,505.00

Agency: Tennessee Department of Commerce and Insurance

Personnel:

PI - David Huddleston, Engineering Administration

Abstract:

Grants Awarded Report

From: 1/1/09 to 1/31/09

Project Title: Strengthening Agricultural and Environmental Education at TSU: Student Experintial Training in Approaches and Techniques for Investigating Interactions that are Important in Agriculture and the Environment

Activation Amount: $11,480.00

Agency: Tennessee State University (via USDA)

Personnel:

Co-PI - Sharon Berk, Water Center

PI - Kim Stearman, Water Center

Support Personnel - Daniel Dodson, Water Center

Abstract:

Students from Tennessee State University will be trained by TTU faculty and staff in soil and water sampling for analysis of metal pollutants and in assessment and visualization of rhizosphere interactions under various conditions, including compost amended soils at the Tech Waters Organic Farm plots, soil microcosms containing metal and organic contaminants, soil microcosms containing plant pathogenic microorganisms, and soil microcosms containing beneficial microorganisms. Students will be trained in gas chromatography by mass specific detector (GC/MSD) for analyzing semi-volatile and trace organic contaminants in environmental samples, the use of inductively coupled plasma emission spectrometry (ICEPS) for analyzing metal contaminants in environmental samples, and visualization of microbial interactions in natural matrices using a Leica confocal microscope. The training exercises will be conducted in the Water Center laboratory and at the Waters Organic Farm. The objectives of the project are to strengthen agricultural and environmental curricula at TSU by training students in modern research techniques, which will attract students, increase student enrollment and strengthen the University's capability to recruit and retain graduate students in agricultural and environmental sciences and biotechnology.

Grants Awarded Report

From: 1/1/09 to 1/31/09

Project Title: Tennessee 3-Star Industrial Assessment Center

Activation Amount: $40,000.00

Agency: U. S. Department of Energy

Personnel:

Co-PI - Kenneth Currie, Manufacturing Center

PI - Glenn Cunningham, Mechanical Engineering

Abstract:

The proposed Industrial Assessment Center (IAC) represents a unified and collaborative approach to industrial assessments that will not only span the entire state of Tennessee but also cover some of the more IAC underrepresented areas of Kentucky, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Arkansas, and Missouri-all within a 150 mile radius! By utilizing the strong institutional bond between three of the six four-year universities under the authority of the Tennessee Board of Regents, the Tennessee 3-Star IAC will draw upon the engineering and technology resources of Tennessee Technological University (lead), the University of Memphis (satellite), and East Tennessee State University (satellite). The proposed IAC is referred to as the Tennessee 3-Star IAC to signify the historical geographic/economic/political divisions within the state: West Tennessee (Memphis), Middle Tennessee (Cookeville), and East Tennessee (Johnson City). By encompassing lead/satellite centers within each division, the Tennessee 3-Star IAC will reach an estimated population base of approximately 10 million and a manufacturing employee base of 1.0 million--once again within a 150-mile radius. Within the state of Tennessee, there are approximately 750 manufacturing concerns with less than 500 but more than 100 employees, and the Tennessee Valley region has been virtually untouched by previous IAC assignments (within the last 10 years) due to excessive geographic distance.

Grants Awarded Report

From: 1/1/09 to 1/31/09

Project Title: Nuclear Energy Research Initiative for Consortia (NERI-C)

Activation Amount: $25,000.00

Agency: Washington State University

Personnel:

PI - Dale Ensor, Chemistry

Abstract:

The radiochemistry laboratory at Tennessee Technological University will evaluate the separation potential of new complexants and phase transfer reagents containing soft donor atoms. Basic liquid-liquid distribution studies of the lanthanides and minor actinides will be done to evaluate the ability of new reagents to separate these two chemically similar families. Using radiotracer techniques, the most promising systems will be fully characterized, and the resulting information used to improve the design of future complexants. Promising phase transfer reagents will also be used to develop new chromatographic materials which could be used for analytical separations and analysis. This technique is especially useful for compounds with limited solubility in normal hydrocarbon diluents. Dry weight distribution ratios, Dw, for Eu(III) and Am(III) using these chromatographic materials will be measured. Based on the Dw values, the best materials will undergo more extensive column studies to completely evaluate their potential for separation of the lanthanides from the minor actinides.