

DEPARTMENT OF PHYSICS

Southern University and A&M College

Baton Rouge, Louisiana 70813

Grants and Contracts Acquired by Departmental Faculty

Spring 2005- Spring 2011

The name of a faculty member is followed by the listing of his/her grants and contracts

Diola Bagayoko

Title: **Louisiana EPSCoR Research Infrastructure Improvement: Computational Materials SUBR Subcontract**

Funding level: \$1,888,169 (Proposal No. 1003897)

Funding Agency: National Science Foundation (NSF)

Duration: 2010-2015

Others: Project Directed by D. Bagayoko.

Title: **SUBR Louisiana Optical Network Initiative (LONI)**

Funding level: \$105,000

Funding Agencies: Louisiana Board of Regents (\$70,000 in 2009 and \$35,000 in 2010)

Duration: Annually beginning in 2009

Others: Project Directed by D. Bagayoko and other faculty members. Please visit

<http://www.loni.org/> for details on results.

Title: **Louis Stokes Louisiana Alliance for Minority Participation (LAMP) Senior Alliance Statewide**

Funding level: \$5,000,000

Funding Agencies: National Science Foundation (NSF), \$500,000 per year, and Louisiana Board of Regents (\$500,000 per year) for five years.

Duration: 2010-2015

Others: Project Directed by D. Bagayoko with Dr. Kerry Davison, Dr. Luria Stubblefield, and Dr. Ella Kelley as co-principal investigators. The project was partly built on the successful model of the Timbuktu Academy (as recognized by NSF reviewers). It is successfully replicating the systemic mentoring of the Academy throughout the State of Louisiana. Please visit

<http://www.ls-lamp.org> for details on results.

Title: **The Sankofa Academy, 21st Century Community Learning Center**

Funding Agency: Louisiana Department of Education

Funding level: \$1.8 Million

Duration: June 1, 2010 to May 31, 2013

Other: Project Director: D. Bagayoko (SUBR). Key investigator/personnel: Janet Reed. This project is to provide academic enhancement services to 400 high school students per year for three years. This work is to “export” the expertise of the Academy to selected high schools.

Title: Faculty and Student Team (FaST) – Brookheaven 2

Funding Agency: The National Science Foundation (NSF)

Funding Level: \$22,000 (Proposal No. 1033076)

Duration: May 2010-March 2011

Other: Project Director: D. Bagayoko. This project supports a faculty member and three students to conduct research at Brookheaven National Laboratory for the summer.

Title: Faculty and Student Team (FaST) – Argonne National Lab

Funding Agency: The National Science Foundation (NSF)

Funding Level: \$26,750 (Proposal No. 1033077)

Duration: May 2010-March 2011

Other: Project Director: D. Bagayoko. This project supports a faculty member and two students to conduct research at Argonne National Laboratory for the summer.

Title: Faculty and Student Team (FaST) – Brookheaven 1

Funding Agency: The National Science Foundation (NSF)

Funding Level: \$26,750 (Proposal No. 1033073)

Duration: May 2010-March 2011

Other: Project Director: D. Bagayoko. This project supports a faculty member and three students to conduct research at Brookheaven National Laboratory for the summer.

Title: Space Grant Scholars (SGS) at the Timbuktu Academy

Funding Agency: Louisiana Space Consortium (LaSPACE)

Funding Level: \$50,000 per year

Duration: May 2010-March 2011 (for Year 1)

Other: Project Director: D. Bagayoko. Dr. Ella L. Kelley is the co-principal investigator. The project is to provide financial support to 10-20 high performing undergraduate students in science, technology, engineering, and mathematics (STEM) disciplines and to immerse them in the systemic environment of the Timbuktu Academy. These scholars are expected to add to the future research workforce for space science and related fields.

Title: “LS-LAMP Bridge to the Doctorate Program” Phase III (BDP-IV)

Funding Agency: National Science Foundation (NSF)

Funding Level: \$987,000

Duration: July 2008 – August 2010

Others: Project Director: D. Bagayoko (SUBR); Co-investigators: Drs. Su-Seng Pang, Isiah Warner, and Steve Watkins (LSU). As per its title, this project is to support 12 doctoral students for the first 2 –years of their studies. The host institution, LSU guarantees financial support for these students for the Ph.D. studies after the first two years of NSF support.

Title: Faculty and Student Team (FaST)

Funding Source: National Science Foundation (NSF), through LA Board of Regents

Funding Level: \$56,500

Duration: 04/24/2007 – 03/24/2010

Other: Project directed by Dr. D. Bagayoko. This project was to support financially two faculty and student teams to conduct research at Brookhaven National Laboratory [Dr. Shaban and two (2) students] and at Argonne National Laboratory [Dr. Reese and three (3) students].

Title: “LS-LAMP Bridge to the Doctorate Program” Phase III (BDP-III)

Funding Agency: National Science Foundation (NSF)

Funding Level: \$987,000

Duration: July 2007 – August 2010

Others: Project Director: D. Bagayoko (SUBR); Co-investigators: Drs. Su-Seng Pang, Isiah Warner, and Steve Watkins (LSU). As per its title, this project is to support 12 doctoral students for the first 2 –years of their studies. The host institution, LSU guarantees financial support for these students for the Ph.D. studies after the first two years of NSF support.

Title: “ExxonMobil Bernard Harris Summer Science Camp (EM-BHSSC).”

Funding Agency: ExxonMobil Foundation – through Bernard Harris Foundation

Funding Level: \$80,000 per year for two years

Duration: February 2007 – January 2008 and Feb. 2008 – Jan. 2009; **Feb 2010 – Jan. 2011**

Others: Project Director: Dr. D. Bagayoko; Dr. Ella L. Kelley, Co-principal Investigator. As per its title, this project is to serve 48 rising middle school students in the Baton Rouge area. They will be in residence, on SUBR campus, for two weeks, and will be engaged in academic enrichment activities in science and mathematics and will execute field trips. Dr. Bagayoko is a co-principal investigator and Dr. Kelley is the project director for the 2010-2011 grants and subsequent ones.

Title: “LS-LAMP Bridge to the Doctorate Program” Phase II (BDP-II)

Funding Agency: National Science Foundation (NSF)

Funding Level: \$987,000

Duration: July 2006 – May 2010

Others: Project Director: D. Bagayoko (SUBR); Co-investigators: Drs. Su-Seng Pang, Isiah Warner, and Steve Watkins (LSU). As per its title, this project is to support 12 doctoral students for the first 2 –years of their studies. The host institution, LSU guarantees financial support for these students for the Ph.D. studies after the first two years of NSF support.

Title: “LS-LAMP Bridge to the Doctorate Program” Phase I (BDP-I)

Funding Agency: National Science Foundation (NSF)

Funding Level: \$987,000

Duration: July 2005 – May 2010

Others: Project Director: D. Bagayoko (SUBR); Co-investigators: Drs. Su-Seng Pang, Isiah Warner, and Steve Watkins (LSU). As per its title, this project is to support 12 doctoral students for the first 2 –years of their studies. The host institution, LSU guarantees financial support for these students for the Ph.D. studies after the first two years of NSF support.

Title: "The Timbuktu Academy"

Funding Agency: Department of the Navy, Office of Naval Research (ONR)

Funding Level: \$950,000

Duration: June 1, 2005 to May 31, 2010.

Others: Bagayoko (Director, and PI), Dr. Ella L. Kelley (Co-PI)

Bagayoko's responsibilities include: principal authorship of the proposal and the directorship of the overall institution-wide project that is housed in the College of Sciences. Dr. Kelley directs the entire pre-college outreach operations, including summer programs, the pre-college Science Bowl, and the Learning Olympiads (Year round ACT/PSAT/SAT preparation). This project has 4 components that are (1) Residential Summer Enrichment for 40 high school students (the Summer Science Institute), (2) Summer Bridge Program for 30 incoming freshmen, (3) Research participation and financial support for 20-50 science, technology, engineering, and mathematics (STEM) majors at SUBR, and (4) rendering professional services to the educational community (K-Graduate School) partly through pertinent publications, extensive presentations, and others for **“avoiding and closing academic achievement gaps”** from pre-K to graduate school and beyond. Please see (for details on the paradigm, programs, and results of the Academy.) <http://www.phys.subr.edu/timbuktu.htm> .

Title: **Louis Stokes Louisiana Alliance for Minority Participation (LAMP), Phase 3**

Funding level: \$5,000,000

Funding Agencies: National Science Foundation (NSF), \$500,000 per year, and Louisiana Board of Regents (\$500,000 per year) for five years.

Duration: 2005-2010

Others: Project Directed by D. Bagayoko with Dr. Kerry Davison and Dr. Laira Stubblefield as co-principal investigators. The project was partly built on the successful model of the Timbuktu Academy (as recognized by NSF reviewers). It is successfully replicating the systemic mentoring of the Academy throughout the State of Louisiana. Please visit <http://www.ls-lamp.org> for details on results.

Title: **"The Timbuktu Academy"**

Funding Agency: Department of the Navy, Office of Naval Research (ONR); Award No. N00014-04-1-0587; SUBR Account No. 05-02-20906.

Funding Level: \$1,000,000 from 2004-2011.

Duration: June 1, 2004 to May 31, 2010.

Others: Bagayoko (Director, and PI), Dr. Ella L. Kelley (PI)

Bagayoko's responsibilities include: principal authorship of the proposal and the directorship of the overall institution-wide project that is housed in the College of Sciences. Dr. Kelley directs the entire precollege outreach operations, including summer programs, Pre-college Science Bowl, and Learning Olympiads (Year round ACT/PSAT/SAT preparation). This project has 4 components that are (1) Residential Summer Enrichment for 40 high school students (the Summer Science Institute), (2) Summer Bridge Program for 30 incoming freshmen, (3) Research participation and financial support for 20-50 science, technology, engineering, and mathematics (STEM) majors at SUBR, and (4) rendering professional services to the educational community (K-Graduate School) partly through pertinent publications, extensive presentations, and others for **“avoiding and closing academic achievement gaps”** from pre-K to graduate school and beyond. Please see (for details on the paradigm, programs, and results of the Academy.) <http://www.phys.subr.edu/timbuktu.htm> .

Title: **Master's Degree Program in Physics (expenditures handled as done with grants)
(Treated in every respect as a grant--funded pursuant to a competitive proposal)**

Funding Agency: Louisiana Legislature and Board of Regents, General Appropriations

Funding level: Between \$300,000 and \$500,000 per year

Duration: 1996-indefinite: this is a new graduate degree program

Other: Bagayoko is the director of this program and the principal author of the proposal that led to its inception at SUBR. The entire graduate faculty of the department participates in the successful operation of this program including several highly competent and dedicated staff members and students. Even though it is an academic program, it is operated as a sponsored program with its separate budget, quarterly and annual reports, etc.

Current Projects Significantly Involving Bagayoko (but not Directed by him)

Title: **Physics and Mathematics at the Timbuktu Academy (PMTA)**

Funding Agency: The National Science Foundation, NSF Award No. DUE-0631151

Funding Level: \$496,800

Duration: January 1, 2007 to December 31, 2010.

Others: **This project is** directed by Dr. Joseph Meyinsse, with Dr. D. Bagayoko and Dr. Luria Stubblefield as Co-Principal Investigators. **It is to provide up to \$4000 to 17 eligible Physics and Mathematics major, per year and for four (4) years, fro their BS degree pursuits. These students are to be immersed in the systemic mentoring model of the Timbuktu Academy.**

Title: **"Louisiana Space Consortium (LaSPACE)"**

Funding Agency: NASA

Funding Level: \$150,000 NASA; \$100,000 La. Board of Regents

Duration: March 1, 1991- February 28, 1998. and 1998 to 2011

Others: A Consortium of 16 Louisiana Institutions. Dr. John Wefel of LSU is the Director and Bagayoko, at SUBR, is the Associate Director. A \$60,000 LaSPACE subcontract to SUBR was acquired and directed by Bagayoko from 1992 to around 1998. As of 2006, LSU and SUBR have earned the status of **Space Grant Colleges**, pursuant to the continued funding for LaSPACE.

PREVIOUS SUPPORT

[Over thirty seven (37) Projects. Project Directors named first, under Other.]

Title: **“Program to Enhance the Pursuit of Education and Learning in Engineering and Science (PIPELINES)”**

Funding Source: NASA, Through Iowa State University (ISU)

Funding Level: \$419,954

Duration: Spring 2005 to Fall 2008

Other: This project is directed by Dr. Diola Bagayoko. Dr. Terrence Reese is a co-principal investigator. The project's aim is to promote science and mathematics education reforms in selected schools through professional development, parental involvement activities, and others. NASA Earth System Science and other resources are utilized, when applicable.

Title: **Science Mission to Planet Earth (SMPE) – an NSF ITEST Project**

Funding Agency: The National Science Foundation (NSF)

Funding Level: \$1,585,956

Duration: October 1, 2005 to September 30, 2008

Others: This project is directed by Dr. Fulbert Namwamba, with Dr. D. Bagayoko, Dr. Luria Stubblefield, and Dr. Michael Stubblefield as Co-Principal Investigators. This major project entails professional development for K-12 teachers, with emphasis on the middle school, summer institutes (in Madison Parish and at SUBR) for middle school students. A subcontract to Carnegie Learning deals with some aspects of the Curriculum Development while another subcontractor deals with the comprehensive, external evaluation.

Title: **“SUBR LS-LAMP”**

Funding Sources: NSF and LA Board of Regents

Funding Level: \$125,000

Duration: November 1, 2006 to October 31, 2007

Other: Project Director: Dr. D. Bagayoko; Co-principal investigator: Dr. Ella L. Kelley. This project is for the implementation of LS-LAMP at SUBR. It provides systemic mentoring and financial support for deserving STEM students at SUBR, in 10 different departments.

Title: **Faculty and Student Team (FaST)**

Funding Source: National Science Foundation (NSF), through LA Board of Regents

Funding Level: \$56,500

Duration: 05/12/2006 – 04/12/2007

Other: This project was to support financially two faculty and student teams to conduct research at Brookhaven National Laboratory [Dr. Shaban and two (2) students] and at Argonne National Laboratory [Dr. Reese and three (3) students].

Title: **Recovery Initiative for Summer Enrichment (RISE) at the Timbuktu Academy**

Funding Agency: Louisiana Family Recovery Corps (LFRC).

Funding Level: \$77,000

Funding Period: Spring 2007 to December 2007

Others: **D. Bagayoko** is the project Director, **Ms. Tamiara Wade** the project Manager, and **Ms. Brenda McNeely** is the Program Administrator for LS-LAMP. RISE is to engage up to sixty (60) Katrina or Rita Displaced Students (Rising 4th to rising 9th graders) in the East Baton Rouge Parish in a 4-week, non-residential, academic enrichment, recreational, and emotional uplifting activities on the campus of Southern University and A&M College, in the month of July 2007.

Title: **Summer Training and Enhancement Program (STEP) at the Timbuktu Academy**

Funding Agency: The Baton Rouge Area Foundation (BRAAF)

Funding Level: \$49,000

Funding Period: Spring 2007 to December 2007

Other: **D. Bagayoko** is the project Director, **Ms. Tamiara Wade** the project Manager, and **Ms. Brenda McNeely** is the Program Administrator for LS-LAMP. STEP is to engage up to thirty two (32) Katrina or Rita Displaced Students (Rising 6th to rising 9th graders) in East Baton Rouge Parish in a 2-week, residential, academic enrichment, recreational, and emotional uplifting activities on the campus of Southern University and ARM College in Baton Rouge (SUBR) from July 9 to July 20, 2007.

Title: **“Graduate Research in Energy and the Environment”**

Funding Source: Louisiana Board of Regents (BORSF Enhancement)

Funding Level: \$22,000

Duration: July 1, 2005 to June 30, 2008

Others: **Dr. E. L. Kelley** is the director of this project. Other investigators are **Dr. Jing-Fong Wei, Dr. S. Hasan, and Dr. D. Bagayoko**. This enhancement project is for fuel-cell related research that is expected to lead to environmentally friendly technologies.

Title: **“SUBR LS-LAMP”**

Funding Sources: NSF and LA Board of Regents

Funding Level: \$125,000

Duration: November 1, 2005 to October 31, 2006

Other: Project Director: Dr. D. Bagayoko; Co-principal investigator: Dr. Ella L. Kelley. This project is for the implementation of LS-LAMP at SUBR. It provides systemic mentoring and financial support for deserving STEM students at SUBR, in 10 different departments.

Rambabu Bobba

Title: Energy Conversion and Storage Devices: Renewable Energy Research and Education

Funding Source: U.S-DOE-NREL-MURA program

Funding Level:\$245,000

Others:[Subcontract # ACQ-4-33623-01]

Title : Nanocrystalline Electrodes and Electrolytes for Hybrid Power and Energy Devices for U.S-Army

Funding Source: U.S-DOD-ARO

Funding Level: 250,000

Other: [Grant # W911NF-07-1-0426]

Title: Nanoionic and Nanocomposite Polymer Electrolyte Membranes and Catalysts for Fuel Cells and Hydrogen Energy

Funding Source: : U.S-DOD-AFOSR

Funding Level\$536,130

Other:[W911NF-08-C-0415]

Edward E. Doomes

Title: Educational Expansion and Research Enhancement with a Dispersive X-ray Fluorescence Spectrometer

Funding Agency: Louisiana Board of Regents;

Funding Amount \$133,385

Other: Contract Number: LEQSF(2007-09)-ENH-TR-66,2007

Title Advancing the Southern University Partnership with LIGO in Materials Research and Science Education;

Funding Source: National Science Foundation;

Funding Amount: \$200,000

Other: NSF Award Number 0701652,2007

Title: The Enhancement of X-ray Powder Diffractometer Capabilities in the Material Sciences for Research and Teaching"

Funding Source: Louisiana Board of Regents

Funding Amount: \$80,000

Other: Proposal Number 016MUL-06 2006

Ali R. Fazely

Title: MRE Grant.

Funding Source: National Science Foundation

Funding Level: \$1,045,000.

Period: April 1, 2005 – Present

Title: Data Analysis for ATIC

Funding Agency: NASA Award

Funding Level: 300,000

Period: 2005-2010,

Laurence L. Henry

Project/Proposal Title: Modes of Adaptation, Resistance, and Survival for Life Inhabiting a Freeze-dried-radiation- bathed Environment (MARS LIFE)

Funding Agency: NASA

Amount/yr: \$25,000

Total Award Period Covered: Jan. 2011 – Dec. 2014

Location: Southern University – Baton Rouge

Others: Brent Christner (LSU), Greg Guzik (LSU), Gary King (LSU), Fredrick Rainey (LSU), Sumeet Dua (LaTech), John Battista (LSU)

Brief Project description: SUBR's component is a subcontract which involves development of instruments to characterize the atmospheric environment during near-earth altitude sounding balloon flights. In particular, this effort involves a number of SUBR students developing balloon flight payloads to characterize the atmospheric temperature, pressure, relative humidity, and UV intensity as a function of altitude. Standard sensors will be used to measure the full temperature, pressure and humidity range expected during flight and UV intensity will be measured in the A, B and C bands. This Environmental Sensing Payload (ESP) will be flown with a biological sampler payload on the same sounding balloon. The SUBR students will analyze the ESP data and provide results important for the entire project.

Project/Proposal

Title:

<https://www.fastlane.nsf.gov/researchadmin/viewProposalStatusDetails.do;jsessionid=a830c85b229d3725281e?propId=0750931&performOrg=Southern%20University> Correlative Radio Observations of Cosmic Gamma-Ray Sources: A Partnership Program in Astronomy and Astrophysics between Southern University and the University of Massachusetts

Funding Agency: NSF

Amount/yr: \$159,485

Total Award Period Covered: Jan. 2008 – Dec. 2011

Location: Southern University – Baton Rouge

Others: Greg. Stacy

Brief Project description: The Scientific basis of our proposed research initiative is the correlative radio observation of high- energy gamma ray sources using state-of-the-art instrumentation under current development for use with the Large Millimeter Telescope (LMT). We propose here that Southern join with UMass (and informally with INAOE) to assist in the calibration and initial scientific usage of these instruments, with the long-term view of participating in later scientific observations with the LMT itself as it comes online. At Southern we will use the radio science to attract new undergraduates and masters–level students to the field of astronomy. The proposed project will complement these ongoing initiatives and will include both research and educational components. These will include the development of radio science modules at all levels of the curriculum as well as hands-on training in electronics and instrumentation techniques via the ongoing LaACES (Louisiana Aerospace Catalyst Experiences for Students) program.

Professional services:

Developed a new undergraduate level course (Electronics for Scientists course, PHYS 262) for the physics curriculum at SUBR

In collaboration with Dr. Greg Stacy coordinate the NASA/NSF sponsored student PACER-LaACES balloon program at Southern University-Baton Rouge

Pui Man Lam

Title: Research in Statistical Physics of DNA Unzipping

Nature: Research, Principal Investigator

Other: No other co-PI

Funding Agency: Petroleum Research Fund of the American Chemical Society

Amount:\$48,000

Period: January 2005-January 2008

Location: Southern University, Baton Rouge

Title: Statistical Physics of Single Molecule Biopolymers and Epitaxial Growth

Nature: Research, Principal Investigator

Other: No other co-PI

Funding Agency: Board of Regents Support Fund

Amount: \$164,388

Period: June 2007-June 2010

Location: Southern University, Baton Rouge

Title: Research on Statistical Physics of DNA and Polymers

Nature: Travel, Research, Principal Investigator

Other: No other co-PI

Funding Agency: LINK, Board of Regents Support Fund

Amount:\$7,000

Period: June, 2011-December, 2011

Location: Southern University, Baton Rouge

James M. Matthews

“Auger Project - LSU Operations”, U.S. Department of Energy, \$257,000, 4/1/2005-3/31/2006, Louisiana State University, (P.I., with R. McNeil). Data analysis, student support, and travel for work on the Pierre Auger Observatory in Malargue, Argentina.

“Auger Project - LSU Operations”, U.S. Department of Energy, \$230,000, 4/1/2006-3/31/2007, Louisiana State University, (P.I., with R. McNeil)

“Auger Project - LSU Operations”, U.S. Department of Energy, \$188,000, 4/1/2007-3/31/2008, Louisiana State University, (P.I.)

“Auger Project - LSU Operations”, U.S. Department of Energy, \$172,000, 4/1/2008-3/31/2009, Louisiana State University, (P.I.)

“Auger Project - LSU Operations”, U.S. Department of Energy, \$173,000, 4/1/2008-3/31/2009, Louisiana State University, (P.I.)

“Research in Elementary Particle Physics”, U.S. Department of Energy, \$520,000, 4/1/2008-3/31/2009, Louisiana State University, (P.I., with T. Kutter and W. Metcalf).

Stephen C. McGuire

Title: Advancing the Southern University Partnership with LIGO in Materials Research and Science Education

Funding Agency: National Science Foundation Award No. PHY-0701652.

Funding Level: \$300,000.

Period: August 1, 2007 – July 31, 2011.

Title: LIGO Science Education Center Partnership (SUBR)

Funding Agency: National Science Foundation Award No. **PHY-0917543**

Funding Level: \$1,050,000

Period: October 1, 2009 – September 30, 2011

Title: Materials Science, Astronomy and Outreach: A Collaborative Program of Research and Science Education between Southern University and LIGO

Funding Agency: National Science Foundation Award No. **PHY-0101177**

Funding Level: \$603,824.

Period: June 1, 2001 – May 31, 2007,

Title: Advanced Materials for Information Systems: Magnetic and Optical Materials,

Funding Agency: Louisiana Board of Regents Governor's Initiative

Funding Level: 195,700.

Period: July 1, 2002 – June 30, 2006,

Terrence Reese

Title: Nanocrystalline Electrodes and Electrolytes for Hybrid Energy & Power Sources for US-Army

Funding Agency: United States Army Research Office

Funding Level: \$175,000.00

Period: May 2007

Title: Program to Increase the Pursuit of Education and Learning In Engineering and Sciences

Funding Agency: Iowa State University

Period: January 2005

Funding Level: 419,954.00

Jin T. Wang

Title: "Studies of Relaxor and Ferroelectromagnetic materials"

Funding Agency: Office of Naval Research, US Navy, Grant N00014-05-1-0706

Funding Amount and Period: 10-1-2005 to 9-30-2008 for Amount of \$492,391

Category of the funding: research and Education

Title: "Studies of Relaxor Ferroelectric Oxide Perovskites for Energy Conversion and Storage"

Funding Agency: Office of Naval Research, US Navy, Grant N00014-08-1-0785

Funding Amount and Period: 10-1-2005 to 9-30-2008 for Amount of \$449,985

Category of the funding: research and Education

Guang-Lin Zhao

- 1) Project Title: New High Efficiency Thermoelectric Materials for Thermal Energy Harvesting
Source of Support: National Science Foundation (NSF).

Award Amount: \$299,400.00

Funding Period: 8/1/2008--7/31/2011

Location of Activity: Southern University and A & M College

Other Information: Guang-Lin Zhao (PI), Jinke Tang (Co-PI), Shengmin Guo (Co-PI).

Project Purposes: This research project focuses on fabrication, characterization, and understanding of new high-efficiency thermoelectric materials for thermal energy harvesting and conversions. High-efficiency thermoelectric materials are important for power-generation devices that are designed to convert waste heat and other thermal energy into electrical energy. In this project, a novel approach will be explored to enhance the energy conversion efficiency of thermoelectric materials by utilizing doped C₆₀ fullerene base solid materials, C₆₀ fullerene/Bi₂Te₃, and C₆₀ fullerene/TiO₂ nano-composites.

- 2) Project Title: Thermal Transport Measurements of Novel Thermoelectric Materials and Related Systems

Source of Support: Louisiana State Board of Regents,

Award Amount: \$24,400.00

Funding Period: 6/1/2008--5/31/2011

Location of Activity: Southern University and A & M College

Other Information: Guang-Lin Zhao (PI), Laurence Henry (Co-PI).

Project Purposes: The aim of this project is an enhancement of a materials characterization measurement system to permit the acquisition of data to study thermal transport properties of novel thermoelectric materials in research for thermal energy harvesting and conversions.

- 3) Project Title: Study of Electromagnetic Wave Absorption Properties of Carbon Nanotubes-Based Composites

Source of Support: Air Force Office of Scientific Research

Award Amount: \$750,000.00

Funding Period: 6/1/2009--5/31/2014,

Location of Activity: Southern University and A & M College

Other Information: Guang-Lin Zhao (PI/PD), Jin Tong Wang (Co-PI)

Project Purposes: This research project focuses on the studies of electromagnetic (EM) wave absorption properties of carbon nanotubes (CNTs)-based polymer composites. The unusual properties of CNTs present new opportunities for creating new hybrid and multifunctional materials. However, these materials have largely been unexplored for their EM wave absorption properties. The objectives of this research project are the fabrications and characterizations of multi-walled carbon nanotubes (MWCNTs)-based polymer composites and better understanding the origin of the EM wave absorption properties of them.

- 4) Project Title: “MRI-R2: Acquisition of a Transmission Electron Microscope (TEM) for Research, Research Training, and Education at Southern University a Research Undergraduate Institution (RUI)”,

Source of Support: National Science Foundation

Award Amount: \$1.0 million,

Funding Period: 03/01/2010 -- 02/28/2013

Location of Activity: Southern University and A & M College

Other Information: Edwin Walker (PI/PD), Guang-Lin Zhao (Co-PI).

Project Purposes: The goal of this proposed acquisition of a 200 kV TEM instrument is to strengthen and increase research, research education, and training of students from Biology, Chemistry, Physics, Mechanical Engineering, and Electrical Engineering at Southern University. Additionally, this acquisition will afford us high resolution TEM capabilities and provide a user friendly and efficient TEM instrument for routine and state-of-the-art high-resolution TEM. There are two specific objectives to be considered to achieve this goal. The first objective is to enrich and enhance research with Transmission Electron Microscopy an indispensable research tool, and the second objective is to provide opportunities for students to become familiar and participate in TEM research.

- 5) Project Title: Louisiana Alliance for Simulation guided Materials Applications (La-SigMA)

Source of Support: National Science Foundation (Award No. EPS-1003897)

Award Amount: \$1,888,169.00

Funding Period: 10/1/2010 -9/30/2015

Location of Activity: Southern University and A & M College

Other Information: Guang-Lin Zhao (Co-PI for energy materials research).

Project Purposes:

6) Project Title: Exploration of Novel Thermoelectric Materials for Thermal Energy Harvesting and Conversions

Source of Support: Louisiana State Board of Regents,

Award Amount: \$10,00.00

Funding Period: 4/1/2008--3/31/2009

Location of Activity: Southern University and A & M College

Other Information: Guang-Lin Zhao (PI).

Project Purposes: The work of this pilot project includes the fabrication, experimentation, characterization, and understanding of new high-efficiency thermoelectric materials by utilizing doped C₆₀ fullerene base solid materials and C₆₀ fullerene Bi₂Te₃ nano-composites. High-efficiency thermoelectric materials are important for power-generation devices that are designed to convert solar and waste heat and other thermal energy into electrical energy in the current endeavor to develop renewable energy technologies. One of the novel features of C₆₀ fullerene solid materials is their super-low thermal conductivity, which is required for a high efficiency thermoelectric material. The preliminary results of the past two year research have shown very promising properties of these materials for thermoelectric applications. The *intellectual merit* of the proposed work lies in the combined research efforts, including advanced material fabrications, characterizations, and computational materials research for understanding the properties of the new materials.

7). Project Title: Acquisition of Novel Thermoelectric Materials Research Equipment

Source of Support: NSF and Southern University and A & M College SMART-UP project

Award Amount: \$49,600,

Funding Period: 3/1/2008 – 2/28/2009,

Location of Activity: Southern University and A & M College.

Other Information: Guang-Lin Zhao (PI).

Project Purposes: The aim of this project is an enhancement of the equipment for novel thermoelectric materials research. Specifically, the requested enhancement equipment includes a Spex 8000M-115 Mixer/Mill for materials preparation; a Centurion QEX Vacuum Furnace for materials annealing; Keithley 6221/2182A Current Source and 2010 Digital Multimeter for electric measurements; MPMS sample tube system for physical property measurement; and MPMS S200 computer hardware and

software for data collections. The requested new equipment will add on to our current facility including a liquid helium Dewar, a high-vacuum system, a Quantum Design PPMS system and a Quantum Design MPMS system. The key objectives of this project will be attained through the acquisition, installation, and utilization of the requested equipment in our research and instructional activities in the Physics Department at SUBR.

8). Project Title: Ab-Initio Predictive Computation and Simulation of the Properties of Transition Metal Cobalt Nanoparticles.

Source of Support: Center for Information Technology Innovation, SUBR.

Award Amount: \$36,028.

Funding Period: March 15, 2007 - June 30, 2007.

Location of Activity: Southern University and A & M College.

Other Information: Guang-Lin Zhao (PI), D. Bagayoko (Co-PI).

Project Purposes: The project is working on the ab-initio calculation and simulation of the electronic properties of transition metal cobalt nanoparticles and carbon nano-tubes.

9). Project Title: NER: Integration of Ab-Initio Computation with Large Scale Molecular Dynamics Simulation for Nanomaterials Research.

Source of Support: National Science of Foundation

Award Amount: \$99,982.00

Funding Period: Aug. 15, 2005 to July 31, 2006.

Location of Activity: Southern University and A & M College.

Other Information: Guang-Lin Zhao (PI).

Project Purposes: The objective of this project is to develop a new computational method and related computer code (computer software) that integrates ab-initio quantum computations with MD simulations. The resulting software will have the capability of MD calculations with the reliability of ab-initio method. The proposed research will have a broad impact on the simulations of nanomaterials for understanding and in some cases for predicting the properties of nanomaterials. Such understanding, based on quantum mechanics at a microscopic level, will shed light on possible mechanism(s) to improve the desired properties of nanomaterials in such a way that it will reduce expensive and redundant experimentation.

10). Project Title: Predictive Computations of Properties of Wide-Gap and Nano-Semiconductors.

Source of support: US Office of Naval Research (ONR).

Award Amount:

Funding Period: 01-Oct-2004 to 30-Sep-2006.

Location of Activity: Southern University and A & M College.

Other Information: D. Bagayoko (PI); G. L. Zhao (Co-PI).