

Materials Science, Astronomy and Outreach:
A Collaborative Program of Research and
Science Education between Southern University
– Baton Rouge, LA, and
The Laser Interferometer Gravitational Wave
Observatory at Livingston, LA

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Department of Physics
Southern University and A&M College
Baton Rouge, Louisiana 70813

OBJECTIVES

- To advance the LIGO scientific objective of researching the basic nature of gravity.
- To further strengthen the undergraduate and graduate physics programs of Southern University.
- To positively impact the scientific literacy of the local community through educational outreach activities.

**Southern University and A&M College
Baton Rouge, LA (SUBR)**

Web address: <http://www.subr.edu>

“SUBR is a comprehensive institution offering four-year, graduate, professional, and doctoral degree programs. The University is part of the only historically black Land Grant university (HBCU) system in the United States.”

Founded: 1880

Accreditation: Fully accredited by the Southern Association of Colleges and Schools (SACS).

Enrollment: An average of 9,000 students at SUBR each year.

Programs: Bachelor's in 42 areas, 20 master's, 3 doctoral and 3 associate degrees.

No. of Faculty: 570

No. of Colleges 7

Annual Budget: \$ 71 M

Department of Physics
William James Hall
Room 157

Website address: www.phys.subr.edu

Chair: Stephen C. McGuire, Ph.D.

Faculty: 19 Full-time, 2 part-time

Degree Programs: B.S. and M.S. in Physics

Research Areas: Materials, Astronomy and Particle Astrophysics, and Education Reform

Enrollment:

Undergraduate	40
Graduate	11

Major Programs: Timbuktu Academy
Auger, OrLAND...

Sponsored research: \$ 3.2 M
(1999-2000)

Trace Element Measurements

Objective

Obtain physical correlations between chemical impurities and optical absorption characteristics of materials under consideration for use as test masses and optical coatings in LIGO II.

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- Neutron Activation Analysis (**NAA**) **NIST**
 - Prompt Gamma
 Neutron Activation Analysis (**PGNAA**) **NIST**
 - Neutron Depth Profiling (**NDP**) **NIST**
 - X-ray Fluorescence (**XRF**) **CAMD**
 - Electron Spin Resonance (**ESR**) **NIST**
 - Extended X-ray Absorption
 Fine Structure (**EXAFS**) **CAMD**
 - X-ray Absorption
 Near Edge Spectroscopy (**XANES**) **CAMD**

The information gained can be expected to:

- Guide the selection of starting materials,
- Provide important feedback on product quality,
- Lead to the establishment of standards for future efforts,
and
- Possibly reduce the financial investment and time arriving at a final instrument.

Program Advisory Committee

Barry Barish
Linde Professor of Physics
and LIGO Project Director
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Pasadena, CA

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LLO
Livingston, LA

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M. R. Smalley
Vice Chancellor for Research
Southern University
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Baton Rouge, LA 70813

SUBR-LLO Interactions (99-00)

- S. C. McGuire gives LIGO SURF Program Seminar “Trace element studies in low-loss sapphire,” 8-24-99.
- E. Ryder, Department Chair of Science and Mathematics Education, SUBR, visits and tours LLO, 9-11-99.
- Mark Coles, Department of Physics Seminar, “LIGO:Catching Gravity Waves,” 10-6-99; meets with Vice Chancellor for Academic Affairs.
- Southern University SPS Chapter visit and tour of LLO, 10-7-99.
- SUBR Administration (Vice Chancellors for Academic Affairs and Research and the Dean of Sciences) participate in the LIGO inauguration. 11-12-99.
- R. Weiss tours the SUBR Department of Physics and gives a department seminar, “What is going on in Livingston, Louisiana: It could be important to astrophysics.” 4-19-2000.
- Several faculty visit LLO for a tour and discussions, 4-26-2000.
- First SUBR Physics students appointed summer 2000 LIGO SURF Program interns, 5/2000.
(K. R. Tubbs and K. C. Williams)

- SUBR Department of Physics Timbuktu Academy summer program students (~80) visit and tour LLO, 7-14-00.
- S. C. McGuire gives LIGO SURF Program seminar, “Trace element characterization of synthetic Al_2O_3 using X-ray and neutron probes.” SCM coordinates tour of CAMD, the synchrotron radiation source in Baton Rouge, for the LIGO SURF students and staff. 7-21-2000.

PROGRAM PARTICIPANTS

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J. Hormes and R. Tittsworth
CAMD/LSU

STUDENTS

Kevin R. Tubbs

“Gravitational Gradient Measurements at LIGO
Livingston Observatory (LLO)”*

and

Keisha C. Williams

“The Global Diagnostic System”*

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*LIGO SURF Program 2000 participants at LLO.

Brandis M. Rawls**

“Search for photon absorption sources in synthetic
 Al_2O_3 ”

and

Karen C. Wilson**

“XRF Detection Limits at CAMD XMP”

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**CAMD Summer 2000 Research Interns.