The Gordon A. Cain Center for Scientific, Technological, Engineering and Mathematical Literacy

Interim Director
M. Jane Collins Retires

M. Jane Collins is retiring in May 2005, after having served as Interim Director of the Cain Center since January, 2004. She has also been coordinating new programs in secondary teacher preparation in Mathematics, Science (Chemistry, Physics and Biologic Sciences), English, Social Studies (History), French, and Spanish. These programs represent cooperative efforts across the Colleges of Basic Sciences, Arts & Sciences, and Education.

Collins joined the LSU faculty in the Department of Communication Sciences and Disorders in 1985. She served as Dean of the College of Arts & Sciences from 2000-2003. She plans to stay in Baton Rouge after retirement and enjoy her many hobbies.

Cain Center Partners with Center for BioModular Multi-Scale Systems (CBM²) in Education Outreach!

The Cain Center (CC) and CBM² have joined ranks to leverage resources and strengthen outreach programs. The partnership has provided resources for projects serving the Audubon Council Girl Scouts and the school districts of St. James, Pointe Coupee, Iberville, East and West Feliciana and East and West Baton Rouge Parishes.

CBM² has also taken an active role in assisting with the development of the Science and Math on the Geaux! van program.

As a result of the partnership, the CC is producing an Electronic Education Outreach Guide for Research Faculty. The publication will be Web-based and include information on various outreach opportunities, possible partnerships, student/school/community data suitable for grant proposals, as well as information about the state of education in the state and region.

Cain Center Takes Role in Secondary Education Redesign

Under the leadership of Jane Collins, the Secondary Education Redesign program has established a Web site and assisted in further developing the goals and outcomes of the program.

[www.secondaryed.lsu.edu]

New Partnership Formed with Shell Oil Company and the JASON Foundation:1000 Teachers Impacted

The JASON Foundation, established by oceanographer Bob Ballard, has partnered with the CC to coordinate professional development for 1000 science teachers across Louisiana.

Through a generous gift of $250,000, Shell Oil Company provided the JASON: Disappearing Wetlands curriculum and teacher professional development to middle school teachers.

The CC was instrumental in contacting districts, arranging regional and district workshops and assisting with program assessment and evaluation.

With our Louisiana shoreline losing acres of land every day, this information is particularly valuable for Louisiana.

Shell also sponsored Argonauts from around the country to participate in the actual expedition held in three coastal locations. LSU’s own Mark Schexnayder was one of the leading scientists accompanying the expedition.

Footage from the various experiments and activities are archived on the JASON Web site for use by teachers.

Also, the CC, Sea Grant, Greg Grandy and Mark hosted a teleconference with the Challenger Center in Indiana to apprise students of wetland land loss and research in Louisiana.

Cain Center Updates

Cain Center Announces Partnership with the Baton Rouge Recreation and Park Commission (BREC)

The Science and Math on the Geaux! van outreach program, sponsored by the Cain Center, is working in tandem with BREC to expand the program throughout East Baton Rouge Parish. Dubbed the Mobile Astronomy Remote System (M.A.R.S.), the CC van provided to BREC will make the study of space and space exploration come to life in area schools and during special events. M.A.R.S. will bring telescopes, StarLab and other equipment into the community, reaching thousands of students each year.

STEP Thru STEM NSF-Sponsored Program Impacts Teacher Education and Gets Results!

The STEP Thru STEM program, sponsored by the National Science Foundation to attract students into science and math education, ends its second year of implementation with impressive results.

Currently, there are 80 STEM (Science, Technology, Engineering and Mathematics) majors officially enrolled in the secondary education concentration, 48 of whom are mathematics majors.

The Department of Mathematics has reported that secondary education is now the largest concentration in their department.

Additionally, STEM majors in the secondary education concentration are mentored by 19 accomplished teachers in 11 local middle/high schools.

To date, the program has awarded more than $200,000 in scholarships. STEP Thru STEM complements the new Redesign program. Contact Peter Sheppard for information: pshepp@lsu.edu.
Center for BioModular Multi-Scale Systems

A $9 million research grant from the National Science Foundation will fund the establishment of the Center for BioModular Multi-Scale Systems or CBM², at LSU. The center represents a collaboration between researchers at LSU, LSU’s Center for Advanced Microstructures and Devices (CAMD), the LSU Health Science Center in New Orleans, Tulane Health Science Center and Xavier University in New Orleans.

This new “Research Infrastructure Improvement Award” is a competitively awarded grant provided through the NSF’s Experimental Program to Stimulate Competitive Research (EPSCoR). The grant was officially awarded to the Louisiana Board of Regents and the Louisiana EPSCoR program. With $3 million from the Louisiana Board of Regents Support Fund and $1.5 million from participating institutions, the grant will total $13.5 million over the three years of funding.

The Center for BioModular Multi-Scale Systems will be located in LSU’s recently acquired 45,000-sq. ft. lab and office complex on GSRI Road, formerly owned by Albemarle Chemical Company. It will bring together an interdisciplinary, multi-institutional research team with expertise in microsystems engineering, materials, chemistry, and biological systems and provide state-of-the-art equipment and facilities. Steven A. Soper, the William L. and Patricia Searl Jr. Professor of Chemistry at LSU, will serve as director of the center. A large number of researchers from LSU will be involved in the project, including faculty from CAMD and the Colleges of Basic Sciences and Engineering.

External partners in the project include researchers from Cornell Medical College, Sloan Kettering Memorial Cancer Research Center, and Baylor College of Medicine.

According to Soper, the center will have three primary missions: basic research, service to the community and country through micro- or nano-fabrication and development, and educational outreach. Soper said the focus will be on building new equipment and tools for medicine, forensics and homeland security applications. “The ultimate goal is to build a national center of excellence in micro-/nano-fabrication for biology and medical purposes,” said Soper.

Wischusen and Withers Selected as Education Fellows

Thirty nine educators from across the country were named Education Fellows in the Life Sciences by the National Academies of Sciences.

Bill Wischusen and Michelle Withers from the Department of Biological Sciences were among a group of educators chosen to attend a summer institute aimed at fostering innovative approaches to teaching undergraduate Biology.

The fellows were members of teams from 20 research-intensive universities chosen based on their ideas for enhancing undergraduate education and a commitment by their universities to support teaching innovations. Teams were also chosen based on their willingness to collaborate on the development of “teachable units” (curriculum packets encompassing a week of classes and lab activities on a specific topic) and their pledge to implement at least one of the units in the courses they teach this year.

The Summer 2004 institute focused on how to improve large introductory biology courses taught by fellows, who collectively teach more than 22,000 students this year.

Bill Wischusen serves on the Advisory Council of the Cain Center.

Michelle Withers is an instructor with the CC’s Project SCIENCE, a middle school professional development program funded by the LA Dept. of Education Math/Science Partnership program serving six school districts within LSU’s service area.

Cain Center Professional Development

Special Session Features

Noted Author

The LaSIP project members from M.A.T.H. 2004: Math and Assessment Taught Hands-on were guests of Pointe Coupee Parish School System at a special professional development session presented by Marcia Tate. In a lively, interactive session, Tate, author of Workbooks Don’t Grow Dendrites, helped the K-5 teachers develop mathematics lessons using strategies that engage the brain. Teachers from Pointe Coupee, East Baton Rouge, and Iberville Parish School Systems benefited from this experience.

Shaquille’s Shoe Sparks Math Sessions

Excitement abounds in classrooms of teachers participating in M³: Math in the Middle Matters. Making appearances from classroom to classroom, Shaquille O’Neal’s shoe has been the focus of ratio and proportion lessons beginning with a comparison of foot length and height. Middle school teachers from the state funded Mathematics Science Partnership (MSP) projects in Iberville and East Baton Rouge Parish School Systems have easily introduced difficult mathematics concepts with such a novel item on view.

JASON Takes Project SCIENCE by Storm!

Middle school teachers in the Project SCIENCE MSP received JASON curriculum and professional development to implement science inquiry learning through technology!
The Cain Center Welcomes New Deans on Steering Committee

M. Jayne Fleener is the E.B. “Ted” Robert Professor and College of Education Dean. Coming to LSU in 2004 from the University of Oklahoma, her teaching and research have been in the areas of philosophy, computer science, mathematics, mathematics education, gender issues in STEM fields, and curriculum theory.

Kevin Carman, Dean of the College of Basic Sciences, received his Ph.D. from Florida State University in 1989 and joined the LSU faculty that same year. His research focuses on marine and freshwater ecology, microorganisms and environmental impacts of CO2 sequestration on deep-sea communities.

Guillermo Ferreyra, Dean of the College of Arts and Sciences, hails from the Licenciado University de Cordoba, Argentina and Rutgers University. He has been at LSU since 1983. His research interests are Deterministic and Stochastic Control Theory, Partial Differential Equations, and Probability Theory.

The Dean of the College of Engineering, Zaki Bassiouni, Bert S. Turner Distinguished Professor, began his career at Cairo University in 1966. He earned his Ph.D. at Lille University in France and arrived at LSU in 1977. His research interests include well logging, petro-physics, reservoir engineering, improved gas and oil recovery.

15-Degree Laboratory Research
Understanding Photosynthesis and Cellular Respiration: N = 263,267
Jewel Reuter and Jim Wandersee

This research study centered on analyzing high school students’ understanding of photosynthesis and cellular respiration by using data from photosynthesis and cellular respiration multiple-choice items of 263,267 student exams from the four most recently released Advanced Placement Biology Examinations, as well as from previous biocurricular research. This study introduced the use of concept and data analysis maps that illustrate the hierarchical relationship of concepts and utilizes reference numbers with sublevel letters to analyze the level of conceptual difficulty and to identify possible paths for assessment or teaching these concepts. This represents a new way of using concept maps to focus instruction and assessment of science knowledge. The content of the test items was also characterized using Bloom’s taxonomy for cognitive categories, conceptual distance levels, physical science knowledge levels, and levels of difficulty related to the history of biology about the discovery of key concepts. Results indicated that the topic of photosynthesis is the most difficult to master, followed by the interrelationship of photosynthesis and cellular respiration, and cellular respiration. The most difficult concepts for the students tested were thylakoid structure, the role of light and chlorophyll, carbon fixation, hydrolysis of ATP, electron transport and chemiosmosis. This research also showed that more recently discovered concepts (e.g., chemiosmosis and ATP synthase activity) were linked to items yielding the lowest percentage of correct answers. Beyond the identification of these difficult concepts, this research offers possible paths for teaching and assessing those troublesome concepts via the study’s concept and data analysis maps of photosynthesis and cellular respiration. It also demonstrates that gaining integrative knowledge of photosynthesis and cellular respiration merits greater attention during instruction. (Currently in review by the Journal of Cell Biology Education)

Algebra Learning
The work of Associate Professor David Kirshner in the Department of Curriculum & Instruction typifies the probative STEM education research of our College.

In the lead off article of the July 2004 issue of Journal for Research in Mathematics Education, Kirshner takes issue with the usual analysis of students’ common errors in algebra as stemming from difficulty with the abstract structure of algebraic rules. When students overgeneralize a correct rule like $(xy)^2 = x^2y^2$ to make a common error like $(x + y)^2 = x^2 + y^2$, the conventional explanation is that they cannot deal with abstractly given rules and need to approach algebra as an empirical science rather than a theoretical one. However, Kirshner’s research shows that such errors are not generated by students’ misunderstanding of the abstract rules—they have not confused addition with multiplication, in the above instance. Rather they are generated by misperception of visual patterns. What Kirshner noticed is that the visual structure of the algebraic symbol system has certain regularities that enable students to demonstrate a superficial competence at the early stages of algebra learning. Unfortunately, this initial competence has been misconstrued by educators as indicating initial understanding of basic algebraic relations. As a result the algebra curriculum offered in our schools and textbooks systematically neglects the fundamental information needed to make sense of algebra rules, thereby condemning (most) students to continue to refine visual patterns in their algebra learning without intellectual grounding. Kirshner’s paper introduces a new curricular approach designed to engage students with the structural underpinnings of algebra. In collaboration with Cain Center colleagues, he currently is awaiting a decision on funding to develop curriculum materials.
Cain Center Celebrations!

Congratulations Cain Council Members and Associates!

Frank Neubrander Named Alumni Professor

DesLey Plaisance Receives Two Awards!
*BP Award for Outstanding Undergraduate Teaching* and the *Tiger Athletic Foundation Award for Outstanding Undergraduate Teaching*

George Stanley Named TIAA-CREF Service-Learning Fellow as a result of his commitment to service-learning scholarship demonstrated through his “ChemDemo” program.

Karl Roider Highlighted through LSU’s *Challenging, Dynamic, Unique Campaign* for having significantly influenced undergraduate students.

David Kirshner Promoted to Professor

Peter Sheppard Awarded Ph.D. from Southern University

Nell McAnelly Selected for Chancellor Search Committee

Brenda Nixon Appointed to LIGO Livingston NSF Advisory Council

Cain Center and Collaborative Partner Grants and Contracts Total $8,607,460

Did you know that the Cain Center and collaborative partners currently have $8,607,460 in grant and contractual funds for professional development for teachers and the attraction, recruitment and retention of outstanding undergraduates?! The most recently funded project is the National Science Foundation GK-12 Fellows Program with Co-PIs Frank Cartledge, Frank Neubrander, Su-Seng Pang, Len Richardson, and Isiah Warner. for $1,558,502—2005-08.

Cain Center Unveils New Website!

Check out the new Website at www.cain.lsu.edu. If you have any links or upcoming events you would like included on the site, please E-mail caincenter@lsu.edu!

Cain Center Staff
M. Jane Collins, Interim Director
Nell McAnelly, Associate Director
Brenda Nixon, Assistant Director
Peter Sheppard, STEM-TP Coordinator
Karrie Camallo, Grants Coordinator

At left, Cain Council Member Pam Blanchard demonstrates Scope-on-a-Rope technology at LSU’s Ocean Commotion

Proud Parents Peter and Karen Welcomed Amia to the Sheppard Family December 29, 2004!