

School of Science 10-year Report for 2012 Reaccreditation

Teaching and Learning

Major Accomplishments:

- **Academic Support Centers:** Math Assistance Center (MAC), Biology Resource Center (BRC), Chemistry Resource Center (CRC), Computer Science Tutoring Center and Psychology Resource Center developed to provide peer mentoring and tutoring to undergraduates, with particular attention paid to first and second year students. Many centers work in collaboration with University College, most staffed by students or staff 40+ hours/ week.
- **Just-in-Time Teaching (JiTT)**, a web-based teaching and learning strategy, developed in Physics Department and expanded to Biology, Chemistry, Math, and over 80 universities.
- **Peer-Led Team Learning (PLTL)** developed for Chemistry C105, employing student peer mentors for collaborative problem solving; PLTL offered with an on-line option, Fall 2010.
- **Peer mentoring programs** developed for Psychology B104 and Biology (K101, K103, N261, N217, N212). Student mentors have successfully completed the course and participate in ongoing content-based mentoring roundtables as well as UCOL leadership courses.
- **Forensic and Investigative Sciences (FIS)** program approved and implemented, new FIS courses and internships developed; BS program currently has over 100 majors. New M.S. Program in Forensic Science (2009) requires 35 credit hours of study beyond the baccalaureate level.
- **Freshman Work Program** created to link student employment to student learning, employing freshmen for 10 hours / week in the Biology and Earth Sciences departments.
- **Life-Health Sciences Internship (LHSI):** Paid campus research internships in laboratories within the School of Science and the School of Medicine for sophomores and juniors.
- **Pre-professional Non-thesis (PPNT) MS in Biology:** 30-credit hour coursework MS for students interested in entering medical school, dental school or other professional school or career.
- **New graduate certificate programs** in Biocomputing, Biometrics, Computer Security, Databases & Data Mining and Software Engineering (2006, Computer and Information Sciences). New Pre-Medical BS Track in Biocomputing (2010, CIS).

Current Status:

- School of Science BS / BA degrees awarded – 200 in 2001; 300+ in 2010
- One -Year Retention Rate (Fall to Fall Semester) 52% in 2001; 86% in 2010
- Six-year graduation Rate: 38% in 2001; 46% in 2010

Plans for the next 5 years:

- **B.S. degree in Neuroscience** - joint program between Departments of Biology and Psychology
- **5-year BS/MS degree** in CS; BA degree in Computer Sciences,
- **5-year BS/MS degree** in Biology or Chemistry (BS) with MS degree in FIS
- **Expand international study abroad** opportunities for undergraduates
- **Expand Honors Course** offerings and experiences
- **NSF Science Talent Expansion Program (STEP) grant** (\$2M, awarded July 2010) – Provides funds for expansion of JiTT, PLTW, Summer STEM Bridge Programs and other initiatives to encourage STEM student support and graduation success, particularly within under-represented populations.
- **School of Science and NSF-STEP goals** are to increase both the 4-year and the 6-year graduation rate to successfully prepare and graduate an additional 782 or more undergraduates by 2015.

- **Increase the quality, quantity, and diversity of STEM majors:** Increase SAT/ACT scores, high school GPA, and class rank of entering freshman, working with Honors College to increase the number of Bepko, Plater, Chancellor and other honors scholarship recipients.

Research, Scholarship, and Creative Activity

Major Accomplishments: (*Signature Centers)

- **Assertive Community Treatment Center** *(Directors Michelle P. Salyers, Mike McKasson) – Research and practice in recovery-oriented, evidence-based mental health services.
- **Center for Biocomputing** *(Director Shiao-fen Fang) - Research in interdisciplinary applications of computer science, biology, medicine, and informatics in the field of biomedicine.
- **Center for Mathematical Biosciences** *(Director Ben Zion Boukai) - Research in computational neurosciences; proteomics and genomics; computational biomechanics and applied biostatistics.
- **Center for Membrane Biosciences** *(Director Robert Minto) - Research on the role of membranes in diseases such as diabetes and breast cancer, and in the control of cellular signaling processes.
- **Center for Nuclear Magnetic Resonance** *(Directors B. D. Nageswara Rao, Bruce Ray) - Research on metabolism and structure-function relationships of biological macromolecules.
- **Center for Regenerative Biology and Medicine** *(Director David Stocum) - Research on regeneration of spinal cord, brain and eye, musculoskeletal and cardiovascular tissues.
- **Center for Visual Information Sensing and Computing** *(Director Jiang Zheng) - Multi-sensory information processing and sensor networks involved in surveillance and counter-terrorism.
- **Center for Earth and Environmental Science (CEES)** * - (Director Lenore Tedesco) examines current and emerging threats to central Indiana's water resources and effect on human health.
- **GK-12 Program** (\$3 M, NSF Division of Graduate Education) - \$30,000 stipends for School of Science and School of Medicine graduate students to bring research experiences into K-12 schools.
- **New Ph.D. in Applied Earth Sciences**, one of the nation's first doctoral programs in applied earth sciences, merging geoscience, geoinformatics and human health.
- **New Ph.D. in Biostatistics**, jointly offered by Department of Mathematical Sciences and the Division of Biostatistics in the IU School of Medicine, leading to a Ph.D. from Indiana University.
- **New Tenure-track faculty:** 11 in AY 2009-2010, 15 in AY 2010-2011, 3 lecturers. Many hires were within Biology and Chemistry, departments that had suffered the greatest recent loss of faculty.

Current Status:

- **Internally funded awards** - \$1.0 M (Sources: RIF, RSFG, PRF grants, Signature Centers)
- **Externally funded awards** - \$11.5 M (33% ↑ over 08-09)
- **Graduate Degrees** awarded 2009-2010: Masters of Science 297; PhD: 128; Total: 441
- **Dean's Office support** for improvement of Core Research Facilities: Laser Scanning Confocal Microscope, Mass Spectrometry Instrumentation, Leica Laser Microdissection System, Research Facilities in Environmental Geochemistry and Health.

Plans for the next 5 years:

- Continue to build a strong and research-active faculty, through disciplinary and interdisciplinary appointments, especially in areas that support IUPUI's life and health sciences mission.
- Expand research, vivarium, and teaching space through construction of newly approved SELB-I (Science and Engineering Laboratory Building, Phase I); SELB-II negotiation underway.
- Increase percentage of faculty proposals for external funding annually from 50% to 80%.
- Double the number of external grants awarded annually from 55 to 110.
- Increase the annual external research awards to \$20 M by 2015.
- Increase annual number of Ph.D. students by 50% to reach 150 annually by 2015.
- Increase postdoctoral fellowships opportunities
- Secure approval for an independent Purdue Ph.D. degree site-approved for IUPUI, with diploma to read: **Doctor of Philosophy, Purdue University School of Science, Indianapolis.**

Best Practices

Major Accomplishments:

- **Positioning of the School of Science** as a strong contributor to IUPUI bioscience research community through funding and support of Signature Centers, investment in areas of basic and translational research in collaboration with the IU School of Medicine, the Department of Biomedical Engineering, and other research groups on campus.
- **Increasing faculty research productivity** by strategic hiring, strengthening research infrastructure, enhancement of interdisciplinary core research facilities, and by research incentive programs.
- **Securing IU approval for Science and Engineering Laboratory Building (SELB), Phase I:** Successful financial management, planning and presentation of plans needed to overcome the lack of adequate space for research and instructional laboratories, to replace outmoded animal facilities with a new vivarium, to expand core research facilities and wet research laboratory space, and to add office space for faculty and graduate students. Planning for Phase II of SELB is underway.
- **Redesign, construction and launch of a new School of Science website** (science.iupui.edu) to provide prospective and current students, alumni, donors and other key audiences easy access to information while highlighting the academic and research strengths of the School of Science.

Current Status:

- **New Office of Student Services** launched to (1) accelerate the recruitment of high-ability students; (2) provide better services in academic advising and career counseling, with the goal of increasing the retention and graduation rate of all students enrolled; and (3) develop more internships, externships, and research opportunities for our undergraduates.
- **New Office of Development and External Affairs** launched to (1) generate more philanthropic and community support, (2) coordinate development and publicity efforts of the School, (3) increase outreach efforts to alumni, and (4) articulate and publicize a bold academic vision to better position the School for the IUPUI *IMPACT* Campaign.

Plans for the Next 5 Years:

- **Completing SELB, Phase I**, and securing approval for SELB, Phase II.
- **Significantly increase alumni, community, and philanthropic support** to (1) Reach or exceed School of Science's goal of raising \$5.5M in the upcoming *IMPACT* Campaign, (2) Double alumni annual giving from 4% to 8%, (3) Build a \$2M scholarship endowment for the Dean of Science Scholarship Program, the Women in Science Scholarship Program, and other school-based scholarship programs, (4) build a \$2M scholarship endowment for graduate student support, and (5) Raise funds to establish at least one endowed professorship for each department.
- **Build an engaged, contributing base of alumni and community members** to (1) Provide opportunities for alumni engagement through the School of Science Alumni Board, its Young Alumni Group, and a Dean's Executive Alumni Council, (2) Facilitate opportunities for community engagement through the Dean's Leadership Council (3) Engage alumni groups in programming promoting professional and social networking, mentoring opportunities, scholarships and service awards, and (4) implement strategies for increasing the number of donors to the Schools
- **Rebrand the School of Science:** (1) Develop and implement a strategy to market the School of Science as "a school of choice" for high-ability students who seek a quality undergraduate education in science, (2) Develop periodic publications aimed at reinforcing the School of Science brand to parents of students, alumni, donors and the Indiana general public and (3) Provide strategies for improving the public presence of the school through its special events functions.

Campus Climate for Diversity

Major Accomplishments:

- **Diversity Research Programs for undergraduates**, developed and managed in collaboration with the Center for Research and Learning (CRL). These programs provide peer support, intensive undergraduate research activities, and individualized programming, providing student with opportunities to become actively involved in increasingly advanced research in preparation for graduate and professional studies, and earn a competitive stipend.
 - Diversity Scholars Research Program (DSRP)
 - Louis Stokes Alliances for Minority Participation (LSAMP)
 - Ronald E. McNair Post-baccalaureate Achievement Program (McNair)
 - Summer Diversity Scholars Research Program (S-DSRP)
 - Undergraduate Research Opportunities Program (UROP)
 - Multidisciplinary Undergraduate Research Institute (MURI)
- **Bridges to the Baccalaureate Program** (\$1 M, funded by the National Institutes of Health) is a collaboration between IUPUI and Ivy Tech to provide underrepresented minority Ivy Tech students with the resources to successfully complete an associate's degree and seamlessly transfer to a bachelor's degree program in a biomedical or life science area. The Bridges Program provides students with resources such as financial support, faculty mentoring and advising, and participation in a faculty-mentored research project at IUPUI.
- **Women in Science House, Women in Science Scholarship:** The Women in Science House is an on-campus residential living and learning community for 30 female School of Science students. Residents of Women in Science House enjoy an environment that fosters academic development, encourages involvement in service learning, and facilitates mentoring and networking.

Current Status:

- **New NSF Undergraduate Research Mentoring in the Biological Sciences (URM) Program** (\$1M) to increase the number and diversity of future life science researchers by broadening participation of African Americans, Hispanic Americans and members of other groups historically underrepresented in science in undergraduate research. Two-year fellowships will be awarded to School of Science students selected and will provide them with the experience and expertise needed to succeed in doctoral programs leading to basic research careers in the biological sciences.
- **New NSF Science Talent Expansion Program (STEP) grant** (\$2 M) – Provides funds for expansion of JITT, PLTW, Summer STEM Bridge Programs and other initiatives to encourage student support and graduation success, particularly within under-represented populations.

Plans for the Next 5 Years:

- Increase the diversity of the student body (to 12% of African-American and 6% of Hispanic students compared to the current 8.47% and 2.46%).
- Develop a marketing and recruiting strategy in collaboration with the School's new Office of Development and External Affairs to strengthen targeted recruitment efforts of first-generation African-American and Hispanic students and increase the quality, diversity and successful graduation rates of highly qualified students.
- Explore non-traditional strategies to recruit national and international students.
- Establish student ambassadors program for transfer students to assist with community college and high school recruiting.
- Increase diversity of the faculty in the School of Science.
- Increase the proportion of School of Science women faculty at more senior ranks.

Civic Engagement

Major Accomplishments

- **Annual Computer Science Day:** for high school students, parents, and teachers. Includes a programming contest, high school teacher professional development, and research posters.
- **Discovering the Science of the Environment:** IUPUI Center for Earth and Environmental Science (CEES) staff and GK-12 Fellows incorporate environmental science summer professional development and curriculum for teachers grades 4-9, with free school-year outdoor learning programs utilizing a mobile DSE resource trailer equipped with interactive technology, web kiosks, and GIS capabilities.
- **High School Genetics Conference:** Provides 400+ high school students and teachers annually an opportunity to learn about developments in medical and molecular genetics.
- **High School Math Competition:** Annual contest to increase math success and interest and to recognize outstanding math and science students for their academic achievements.
- **Hoosier Science and Engineering Fair (HSEF):** 100 middle and high school students selected; 34 advance to the Intel International Science and Engineering Fair, sponsored by the Science Education of Indiana (SEFI).
- **Indiana High School Psychology Teachers Conference:** Professional development for teachers to exchange ideas, explore teaching strategies, and network with IUPUI psychology colleagues.
- **International Brain Bee:** spelling-bee style event sponsored by the Department of Psychology Inspires high school students to learn about the brain and explore careers in neuroscience.
- **Project SEED:** (Summer Experiences for the Economically Disadvantaged) Mentored summer research program for local high school students. Funded by American Chemical Society, School of Science, private donors, and Clinical and Translational Sciences Institute (CTSI).
- **Project Lead the Way:** IUPUI is 1 of 3 sites nationwide to offer an Biomedical Science Summer Institute for high school teachers. 250+ teachers from 32 states have participated since 2008.
- **Summer Research Experience in Physics:** Intensive six-week mentored summer research program for high school students. Sponsored by the D. J. Angus-Sciencetech Educational Foundation.
- **Summer Scientist Apprentice Camp:** Annual two-week summer day camp for middle school students with hands-on laboratory and outdoor field activities.

Current Status:

- All programs listed above run on an annual basis, and at capacity, through the combined effort of faculty, staff, support personnel, funding sources, and community partners.
- New Urban Garden: An IUPUI Sustainability Initiative, the garden is an outdoor learning space that incorporates locally-based urban food production supported by organic gardening practices.

Plans for the Next 5 Years:

- Strengthen the nature and quality of our community partnerships and initiatives, with particular emphasis on those programs that have clearly defined goals and desired outcomes such as increasing the quality, diversity, number of highly qualified students to the School of Science.
- Enhance targeted recruitment strategies of high school students who have participated in our summer research programs, HS Math contest, International Brain Bee, or other programs
- Increase access to summer professional development for K-12 teachers.
- Enhance strategic partnerships with STEM organizations, locally, nationally or internationally, for increased funding for programs and student, increased summer research lab opportunities, travel experiences for students or teachers, or teacher professional development support.

Collaboration

Major Accomplishments

- **Signature Centers** within the School of Science are interdisciplinary and rely on strong collaborative partnerships between schools or departments. Two research groups (Mathematical Biosciences and Biocomputing) recently moved into new Health Information and Translational Sciences (HITS) research space to facilitate collaboration with School of Medicine researchers.
- **Interdisciplinary / Individualized major:** allows self-motivated students to design a unique major that meets their own educational needs, with close faculty advising and supervision.
- **Development of collaborative 5 year BS/ MS in** Physics and Mechanical Engineering (BPMME)
- **Life-Health Sciences Internship (LHSI):** With IU School of Medicine. Paid campus research internships in laboratories in Science or Medicine for sophomores and juniors.
- **Mentoring Programs and Academic Support Centers** developed in conjunction with UCOL.
- **Diversity Research Programs for undergraduates,** developed and managed in collaboration with the Center for Research and Learning (CRL).
- **The Urban Center for the Advancement of STEM Education (UCASE)** is an interdisciplinary center between the School of Science, School of Education, and School of Engineering and Technology. UCASE fosters the goal of increasing K-12 STEM education and STEM teacher preparation through collaborations with the Indianapolis Public Schools and other local schools, the Children's Museum and other partners, the Medical School, and neighboring universities. Current programs funded, managed, or coordinated through UCASE include:
 - **The Woodrow Wilson Indiana Teaching Fellowship** (\$3 M, Lilly Endowment)
 - **The Robert Noyce Teacher Scholarship and Internship Program** (\$1.5 M, NSF)
 - **The GK-12 Urban Educators Program** (\$3 M, National Science Foundation)
 - **The Indianapolis Urban Teacher Residency United Teaching Fellowship Program** (\$2.7 M)

Current Status:

- **Two new signature centers** have just formed with strong collaborative research missions:
 - Integrated Nanosystems Development Institute: a joint Signature Center between the School of Science and the School of Engineering & Technology).
 - Center for Urban Health: between Earth Sciences, and the School of Public Health.
- **New NSF-STEP grant** is a collaborative partnership between the School of Science and School of Engineering & Technology, currently planning for a 2011 STEM Summer Bridge program.
- **2+2 programs:** As part of its strategic alliance with Sun Yat-sen University (SYSU), the new 2+2 dual degree program between the CIS department and the School of Software of SYSU, signed last summer, is the first such program on the IUPUI campus.

Plans for the next 5 years:.

- **Develop collaborative B.S. degree in Neuroscience** - joint program between Departments of Biology and Psychology.
- **Initiate newly approved 5-year BS/MS degree** in Biology or Chemistry (BS) with MS degree in FIS.
- **With Honors College, expand Honors Course** offerings and experiences.
- **Expand international study abroad** opportunities for undergraduates.
- **Expand international research experiences** for faculty and students; two examples are a newly proposed international collaborations with Psychology's clinical psychology and psychobiology programs, both just funded through the IUPUI International Development Fund. This is an important first step in developing collaborative, international research on evidence-based mental health practices.