

# Indiana State University

2006 - 2007 Academic Annual Report

Department of Life Sciences

## Vision Statement

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**Below is your vision statement from previous years. Please take this opportunity to review it and if necessary update it.**

Vision Statement of the Department of Life Sciences The Department of Life Sciences serves undergraduate and graduate students in a similar fashion to our sister R1 and R2 institutions. Effective Jan. 1, 2005, the old Dept. of Life Sciences separated into the new Dept. of Life Sciences (LIFS) and the Dept. of Ecology and Organismal Biology (EOB). The smaller, more efficient LIFS directly supports ISU's mission in that LIFS: 1) offers quality programs at the bachelors, masters and doctoral degree levels, 2) offers programs that include liberal and professional studies, 3) emphasizes interdependent undergraduate and graduate programs, 4) integrates technological advances in instructional activities (see discussion below on experiential learning in "lectures"), and 5) fosters extensive student development through distance education and other forms of flexible scheduling. In contrast to the R1 institutions, we take pride in our tenured and tenure track faculty who teach the bulk of our undergraduate student service courses and majors' courses. Our Life Sciences faculty are heavily involved in original research at the undergraduate and graduate level. Close student-faculty professional contact is a hallmark of our educational philosophy. Life Sciences' goal is to rebuild strong interdisciplinary programs in research and teaching. Strong research programs keep faculty at the cutting edge of their disciplines while simultaneously exposing students to experiential learning and community engagement where they can begin to understand how science progresses. Strong undergraduate instruction is a must as it is the responsibility of every scientist effectively to communicate complex scientific principles to all students. Given these goals and responsibilities, the mission of the restructured Life Sciences Department includes: 1) actively pursuing research and education grants from public and private agencies, 2) providing a comprehensive education for undergraduate and graduate students, 3) aggressively recruiting quality undergraduate and graduate students, 4) strengthening collaborations with Terre Haute Center for Medical Education, Geography Geology Anthropology, criminology and Chemistry, 5) revitalizing Indiana's 21st century initiatives in Biotechnology, Bioinformatics, Forensic Biology, and Molecular Diagnostics, 6) providing biology contents for Science Education, 7) participating in State-sponsored Life Science initiatives, 8) expanding distance learning, 9) fully integrating the BA-MD program, 10) providing quality service courses to non-majors and nursing students, and 11) reestablishing contacts with emeriti and other alumni to encourage participation in the department and financial support. The Department of Life Sciences has several discernable student groups that are served by our broad mix of departmental courses and programmatic structures. The student domains and approximate annual number of students include: 1. life sciences BA/BS majors (50-60); 2. Pre-professional BS/BA students (pre-medical, pre-dental, pre-veterinary; 80-90); 3. Science education BS/BA majors (majority biology education 40-50); 4. Clinical laboratory science BS/BA majors (10-20); 5. Nursing students in Anatomy, Physiology, Microbiology and Pathophysiology service courses (500-750); 6. General education students in LIFS112/112L (800-900 students per year; 53% of total before the split); 7. Graduate MS/MA students (20-25) 8. Graduate Ph.D. students (12-15). Thus, in terms of the breadth of courses and the number of students, teaching demands in Life Sciences are quite substantial. It should come as no surprise that each of these identifiable constituent groups have programmatic needs that differ in

many respects, some being minor (e.g. Life sciences Majors and pre-professional students) and others with significant differences (eg. Science education, Clinical Lab Science, and Nursing) mandated by State and/or Federal "Board" examinations for competence. The graduate programs are also quite unlike the undergraduate programs in that graduate programs are "tuned" for the individual's academic and job market needs; undergraduate programs are usually more "prescribed" with a core curriculum; flexibility exists with a modest number of electives required for each student's degree which allow the student to tune their degree in Life Sciences to meet their specific career goals.

## Year in Review

### Accomplishments

**As you have heard, increasing public awareness of Indiana State University's accomplishments is crucial to building student enrollment, influencing policy makers, and developing a place of pre-eminence in the Midwest. What do you consider to be your department's accomplishments for the 2006-2007 year that will contribute to this effort? [Please list in priority order and limit to no more than 8.]**

Accomplishments: Pursuit of pre-eminence LIFS' high-technology programs in cell and molecular biology, microbiology, physiology, molecular ecology, and evolutionary biology provide critical training needed by citizens of west-central Indiana to take part in Indiana's new economic initiatives in the Life Sciences, participate in the expansion of the pharmaceutical industry in Vigo County, and gain entry into all areas of modern medical sciences. Biotechnology, bioinformatics, forensic biology and all health-related sciences are growth areas. Thus, LIFS plays an essential role in the economic development of Indiana (particularly west-central Indiana) crucial to building student enrollment and in expanding the opportunities available to its citizens. LIFS is the single resource for graduate (M.S., Ph.D.) training in Cell-Molecular Biology and Microbiology (CMMB), excelling in modern molecular approaches to understand fundamental cell biology. Although the various emphases of LIFS have been given separate internal major codes, they are not stand-alone programs since all students require a broad background in the fundamentals of all biological disciplines, such as evolution, ecological principles, and physiology of plants and animals. Despite the smaller size, LIFS continues to efficiently support ISU's mission in the following: 1) offers quality programs at the masters and doctoral degree levels, 2) emphasizes interdependent undergraduate and graduate programs in teaching and research laboratories, 3) producing graduates that successfully compete for jobs and enter the mainstream of study of biological systems. Recruitment of high quality students into LIFS CMMB has increased since the split in our department. Recruitment strategies are focused on personal interactions with potential graduate students. Documentation of Department's Primary Focus Last year, in response to the program prioritization initiatives of the University, the Department of Life Science submitted six separate documents on ongoing programs offered by Life Sciences. These documents written collectively by all members of the Department include: (1) UG-CIP2821.doc., (2) Lifs-Micro.CIP 2832.doc, (3) Lifs-physiol.CIP2863.doc., (4) Lifs-Sports Med. CIP2871.doc, (5) Lifs-CLS.CIP2833-2860.doc, (6) Lifs-Ecol.CIP2861-2864. Experiential learning: training, and use of technology In Life Science Department, experiential learning involves the opportunity for undergraduates to know the basic concepts and practices of important areas of biology, and do cutting-edge research alongside faculty. Such efforts often result in peer-reviewed publications and presentation at national and international discipline-based conferences, and regionally at Sigma-Xi, Indiana academy of Sciences, ISU research showcase forums. Our focus on experiential learning is reflected by our strong research-based capstone program; our new Xi Kappa chapter of TriBeta National Biological Honor Society; the success that our students have had in presenting research at local, regional, and national competitions and conferences; and the many research papers published by our students. For example, undergrads are being trained to perform

bioinformatic analyses using ISU's recently acquired state-of-the-art High Performance Computing system, and these students' present posters at a regional undergraduate conferences (Butler-URC). Also a new course has been developed by Drs. Jennifer Inflow of chemistry and Gary Stuart of Life science to teach upper-level undergraduates and graduate students in the basics of bioinformatics; this course developed in collaboration with Chemistry is to be offered in fall 2007. The faculty at LIFS improved the techniques to deliver "lectures" focusing on experiential learning. Student response systems (student remotes), computer-enhanced learning, problem-based learning, and student presentations are employed to engage students in the learning process. The Department is committed to the ideals that science is built upon experiential learning, and computer literacy, and that learning occurs through engagement. Outcome assessment We have discussed about our strategy to do a series of assessment goals in our Dept meetings. A committee will look into the Department's faculty goals for educating future biology students. The possibility of instituting a mandatory assessment of undergraduates (in biology content and concept) at the entry level and during senior years is being considered. The relevant Student Outcomes Assessment documents for each of these groups are: 1. Student Outcomes Assessment Plan (draft May 2, 2005) BA/BS in Life Sciences, 2. Student Outcomes Assessment Plan (draft May 2, 2005) MA/MS in Life Sciences, 3. Student Outcomes Assessment Plan (draft May 2, 2005) Ph.D. in Life Sciences. Graduate program assessment is implemented by and through the above-mentioned departmental constituents (i.e., Departmental graduate affairs committee, major professor and/or graduate committee chairperson, students' graduate committee members). The goal of our assessment process is to improve our competitiveness for graduate students with respect to other R1 and R2 institutions. The major regional institutions identified include: 1. Indiana University Biology Department, 2. Purdue University Biology Department, 3. Miami University (OH) Biology Department, 4. Ohio University Biology Department, 5. Illinois State University Biology Department, 6. University of Missouri, St. Louis Biology Department. We examine programs that have exceptional curricula, comprehensive core course structures, etc. and extract the best practices from these programs to enhance our existing programmatic structures. We plan to determine the potential benefits of creating a formalized undergraduate tutoring program. Many of our undergraduate service courses (e.g., nursing anatomy, physiology, microbiology, human biology for general education students, etc.) could gain significantly from a more formal tutorial program involving our graduate teaching assistants or bright undergraduate work-study students who excelled in the courses during previous semesters. Some graduate students who would like to be teachers and can allocate time outside his/her own research programs could gain from investing time as a tutor. This practice would hone the graduate student's teaching ability as well as help them learn best practices. We envision the graduate student tutor "list" as a function of past laboratory/classroom assignments in Life Sciences. The use of undergraduate students who have excelled in specific service courses and who qualify for work study employment at ISU as tutors and review session leaders should provide further aid for at-risk students in these courses and improve academic performance and retention rates. The Life Science professors involved with teaching anatomy, physiology, microbiology and pathophysiology will jointly meet with the School of Nursing faculty and advisors to seek out desired and effective student outcomes. These outcomes must address the competency based State and Federal "Board" examinations that, upon successful completion, certify nurses to practice medicine. The Life Sciences faculty will visit with the State Board staff to evaluate and integrate their "standards" within all of the Nursing service courses. Assessment will be, in part, a function of academic and curricular changes within the Department of Life Sciences nursing service courses. In addition, the competency evaluations and the student's pass/fail rates will be used as an additional assessment measure. We will glean from the State Board, pass/fail rates on a question-by-question basis, where possible, to better tune our curriculum to the Nursing student's certification need.

### Research and Scholarship

**What is your assessment of accomplishments in the area of research and scholarship that is**

**focused primarily on contributions to practice and discipline-based scholarship? Are you satisfied overall? In which areas do you feel your department does particularly well? In which areas do you feel your department needs to improve?**

Research and Scholarship As mentioned earlier, the faculty and graduate students of the restructured Life sciences in 2006-2007, 1) published 10 research papers, 3 book chapters, filed 2 US patent applications, 2) presented about 20 research papers at conferences and scientific meetings. The professional expertise of Life science faculty extends beyond the classroom. Dr. Timothy Mulkey serves as the Web manager of the Association of College and University Biology Educators (ACUBE) and the American Society for gravitational and Space Biology (ASGSB). He serves as the expert in information technology advisory committee of the university. Publications: Al-Shaibi, N., King M., Duong T. & Ghosh, S.K.: 2007. DP58, an inducible myeloid protein, is constitutively expressed in murine neuronal nuclei, *Frontiers in Biosciences*, 12:2947-2956. Lim S., Meyer M., Kjonaas R. A. and Ghosh S. K. 2006. Phytol-based novel adjuvants in vaccine formulation: 1. assessment of safety and efficacy during stimulation of humoral and cell-mediated immune responses, *J. Immune-based therapies and Vaccines*, 4: 6. Lim S., Bauermeister A., Kjonaas R. A. and Ghosh S. K. 2006. Phytol-based novel adjuvants in vaccine formulation: 2. assessment of efficacy in the induction of protective immune responses to lethal bacterial infections in mice, *J. Immune-based therapies and Vaccines*, 4: 5. Hoffman A. M Robakiewicz P. E. Tuttle E. M., Rogers L. J. 2006. Behavioral lateralization in the Australian magpie (*Gymnorhina tibicen*) laterality, 11 (2), 110-121. Hoffman A. M., Tuttle E. M., 2006, Elopta: A novel Microcontroller based Operant Dice, *Behavior research methods* Gonser R. A., Horn J. S. 2007. Deer-vehicle Collisions along the suburban-urban fringe (pp. 177-196) A book Chapter (springer-Verlag). Hughes J. P. 2007 Applied cell and Molecular Biology for engineers- Photosynthesis and cellular respiration. A chapter, McGraw-Hill. Hughes J. P. 2007 Applied cell and Molecular Biology for engineers-Signal transduction mechanisms. respiration. A chapter, McGraw-Hill. Stuart G. W. 2006. Total open reading frame analysis of all plus-strand RNA plant Viruses. *Archives of Virology*. Tuttle, E.M. 2006. LTREB: The Evolution of Alternative Strategies. In: *Research Design and Proposal Writing in Spatial Science* (Edited by J.D. Gatrell, G.D. Bierly, & R.R. Jensen). Springer-Verlag. Another key measure of research and scholarship is presentation of scholarly work at local, regional, national and international conferences and scientific meetings. During this review period, several faculty, or their graduate students presented at conferences and meetings. Many of these presentations were by graduate and undergraduate students who gain valued experience through their participation at conferences and scientific meetings. The following does not include presentations done at Indiana academy of sciences and at ISU Research Showcase. Some of the highlights available at this time for reporting are: Nathan Sperry and Gonser R. A. 2006. The AAAS Conference at San Francisco, California. Lava Kumar K. and Ghosh S. K, 2006. American Association of Cancer research Tumor immunology conference. Miami. Florida. Finally, the scholarship of the faculty is also measured in terms of participation in the peer review of scholarly articles and grants. Almost all members of the faculty serve as the peer reviewers for national and international journals in biological sciences that span from cell and molecular to evolutionary biology. Examples are: *Advances in Space Research*, *Animal Behavior*, *Behavioral Ecology*, *Behavior*, *Behavioral Ecology and Sociobiology*, *Bioinformatics*, *Bioscene – Journal of College Biology Teaching*, *Cancer research*, *oncology*, *American journal of Immunology*, *Frontiers in Biosciences*, *Environmental Health sciences*, *Ecology*, *Ecology Letters*, *Endocrinology*, *Evolution*, *Experimental Biology and Medicine*, *Forest Ecology and Management*, *Gene*, *Gravitational and Space Biology*, *Hoosier Science Teacher*, *Journal of Avian Biology*, *Journal of Experimental Zoology*, *Journal of Soil and Sediment Contamination*, *Molecular Biology and Evolution*, *Nature*, *New Phytologist*, *NIH*, *NSF*, *Oikos*, *Plant and Soil*, *Pedobiologia*, *Proceedings of the Royal Society of London-Series B*, *Soil Biology & Biochemistry*, *USDA*, and *Wilson Bulletin*. Dr. Ghosh critically reviewed for the publisher like Benjamin Cummings, chapters of textbooks. Some faculty members such as Dr. Dannelly

participate as the regional technical/professional expert in Terre Haute Mayor's office.

### Grants, Contracts & Off Campus Professional Service

**What is your assessment of accomplishments in the area of grants, contracts, and off campus professional service? Are you satisfied overall? In which areas do you feel your department does particularly well? In which areas do you feel your department needs to improve?**

Grants, Contracts & Off Campus Professional Service Our grant-related activities in 2006 include the following: Thirteen discipline-based extramural grants and contracts, 4 learning and pedagogical research grants, 9 experiential learning grants, and 10 community-engagement research grants were submitted in 2006. Almost half of these grants have been funded. We have not gotten a chance to realize our full potential in securing extramural grants, although we submitted a significant number of grants. This is because of our overwhelming pre-occupation with teaching, servicing and advising biology students with fewer faculties. Since the creation of the new Life science department in 2005, most of the teaching responsibility in all areas of biology for majors, Pre-professionals, GenEd and allied sciences (such as nursing, CEP and CLS) lies with this restructured Lifs Dept, even though there are fewer faculty than the Dept. had when it started in 2005. Dr. Marcella Stevens left the University in 2005, and just before spin-off, we lost Dr. Chen, our molecular physiologist (to cancer), and then Dr. Prentice, the cell biologist (who left to join another institution). The Department's scholarly and creative activities have gone up significantly since the departmental split; the faculty have been very active in promoting undergraduate and graduate research and in securing extramural funds from both governmental and no-governmental agencies. In coming years, the Department plans to focus more on attracting extramural funds. All members of LIFS serve professionally in various capacities at the University and off-campus. To name a few, Dr. Dannelly is associated with technical/professional work at Terre Haute Mayor's office; she is the National faculty advisor of Tri-Beta biol honor society in life science chapter, and ISU Biosafety committee; she has been also a member of CAS Faculty council. Dr. Ghosh, the interim chair of Life science since Jan, 2005, is one of the managing editors of a journal, *Frontiers in Biosciences*. He is also an active member of various national and international professional societies. Last November, he invited and organized a seminar on National science Policy by Professor Bruce Alberts of UCSF, a renowned scientist and a past President of the US National Academy of Sciences This was possible due to participation and sponsorship of all academic institutions at Terre Haute. Dr. Gonser organizes two important community-based events for professional development of biosciences in Terre Haute: (1) Double helix Day Seminar speaker series; secured a corporate sponsor with IDT, and co-hosted with Saint-Mary's-of-the-Woods College, and The Honors and First year programs at ISU. (2) Darwin Day Celebration speaker series; developed in partnership with the department of Science and Mathematics at Saint-Mary's-of-the-Woods College, and The Honors and First year programs at ISU. He also serves in CAS science education advisory Committee, and its faculty search committee. In addition serves in departmental budget and curriculum committees. He serves the Hoosier Science Teacher, State of Indiana as a reviewer. His other involvement is as the Director of Indiana chapter of JSHS for the state of Indiana Drs. McLean and Tuttle have been instrumental in the establishment of the group Women in Biology to support women graduate students and faculty. There are two main purposes of this group. Firstly, participation in the group allows the grad students to get to know the women faculty in an informal setting so that if there are any issues that students need advice about (e.g. who to ask for a reference letter, balancing work and family, writing papers, exploring research ideas, TA issues), they know who to talk to and are comfortable talking to at least one of the faculty. Secondly, participation in the group will allows students from different disciplines in the department to get to know each other, talk about the commonalities in their experiences, and engage in cross-fertilization in research. Community Research Projects. The department is engaged with research projects which impact the community. For example, Dr. McLean and her students have received a grant "Brownfield Remediation in Terre Haute as a

Community Demonstration and Teaching Tool” which will develop a site along the Heritage Trail in Terre Haute as an educational and teaching site. The permits required for this project are being negotiated and implementation of this project should commence this summer. Dr. Mulkey serves in an editorial capacity for Bioscience, the science educational journal by ACUBE (Association of college and University Biology Educators). He is the web Manager of the Organization and another organization: ACGSB, the American Society for gravitational and Space Biology.

## Teaching

**We would like to highlight innovative approaches to teaching. Has your department developed any pedagogies or practices you'd like to share with us? Please describe briefly.**

LIFS' programs are mainstays for all pre-professional students in medical sciences, students who are among the highest-achieving, most goal-oriented students at ISU. The purpose of successful pedagogies is not only to deliver contents but to instill interest in the topics taught and nurture the ability for critical thinking. The faculty of Life science have therefore making an ongoing effort to improve on pedagogy and practice; this resulted in a number of the innovative approaches to teaching. At least, three distinct groups of students are served by the Department of Life sciences at the undergraduate level: (1) Majors, (2) pre-professionals, and (3) Gen Ed students. In addition, there are non-traditional students, and students who enroll in web-based courses. We are also serving an increasing population of transfer students who come with varied levels of educational experience and credentials. Pedagogies and practices that address these separate bodies are being developed and implemented on a continuing basis. Experiential learning is, therefore, an essential component for faculty of Life sciences in catering to the needs of first two groups; it allows them to understand and participate in cutting-edge research alongside faculty. One venue for introducing experiential learning is the Departments' research capstone program, and creative use of the Life science seminar course (Lifs 490/590) which holds special series in imparting concepts in major topics of biology such as evolution (Darwin lecture & Watson-Crick Double helix lecture). Frequent critical thinking opportunity is available to our majors at our Xi Kappa chapter of TriBeta National Biological Honor Society. The measurable outcome is in the success of our students who get admission into professional schools or graduate schools for higher studies. They also successfully present research at local, regional, and national competitions and conferences; and research papers are also published by our students. For large-enrollment classes (at 102 and 112 -level covering majors and Gen Ed students), Dr. Hughes created “lectures” focusing on experiential learning. Student response systems (student remotes), computer-enhanced learning, problem-based learning, and student presentations are employed to engage students in the learning process. The Department is committed to the ideals that science is built upon experiential learning and that learning occurs through engagement. The University's laptop initiative has further helped improve the delivery of lectures in large enrollment classes, and created general enthusiasm for science. Drs. Brett and Hughes hold special review sessions on Tuesday evenings throughout the semester and address deficiencies or other issues that are beneficial to improve understanding of biology and help in building persistence. Individual students are encouraged to come to the instructors' office if they need tutoring on specific topics and case studies. This approach has been very useful in retention and grade improvement for many of our service courses (physiology, pathophysiology and microbiology for students in nursing and allied health science). Our web-based courses are increasingly attracting students from all over the States. The innovative delivery life science biology courses by Dr. Mulkey are a new approach started in the department of Life Sciences. Students are regularly mailed the instruction, and reagents needed to do the specific experiments. They mail back their results, and freely interact with the instructor to perform the experiments. We are offering these courses all through the year. Our online courses for nursing students have also been well received. We are exploring the possibility of offering other required courses for Gen Ed students. Without these life-transforming opportunities, many area students could not hope to be part of the Life-Sciences explosion in Indiana and the

nation. High visibility programs, such as the BA-MD with the IU School of Medicine - Terre Haute, depend upon the courses and training specifically offered by LIFS. Teaching and training of Master's and Doctoral students: As a PhD granting Department, LIFS has a number of vibrant and viable graduate programs reflecting faculty expertise. Primarily, all are focused on the Cellular, Microbial and Molecular Biology (CMMB) and molecular ecology graduate programs. The goal of the Cellular, Microbial and Molecular Biology (CMMB) and molecular ecology graduate programs in the Department of Life Sciences is to produce professionals with well-rounded, research-based understanding of the biological systems of the unit of life, the cell and organism as a whole. We are never without more applicants than we can accommodate; only about 10% of qualified applicants are accepted each year. Service courses offered by the graduate program include LIFS 633

Pathophysiology. This course is offered to meet the needs of the graduate nursing program. Faculty in LIFS have incorporated integrative teaching and research techniques for graduate students that are best described by the phrase "From Molecules to Ecosystems". LIFS' graduates' students earn degrees in molecular genetics, immunology, physiology, microbiology and in ecologists/evolutionary biology. Courses have been designed that use modern cell-molecular concepts and techniques. Faculty are personally involved in providing unique graduate experience. Successful students go to industry and academia. Their post-doctoral experience occurs at Harvard, Johns Hopkins, and other peer institutions. Highlights of the program include, 1) novel graduate courses that utilize modern technologies (e.g. Molecular Ecology & Evolution, Microbial Ecology, Virology, Disturbance Ecology, Population Genetics, Immunology, Behavioral Ecology, Seminar in Genetics & Evolution, Recombinant DNA), 2) a well-developed and multi-faceted structure for professional development in academia, industry, and government using a combination of course-work (e.g. Grad Presentations, Grant Writing, Prep for College Teaching) and experiential learning experiences, 3) a unique program that provides students breadth, flexibility and training in a novel scientific discipline. In general, the research in biology must continually evolve due to the ever-changing "landscape" of technology. Therefore, the department fosters critical thinkers with the ability to adapt and integrate ecological and evolutionary knowledge with these emerging technologies. Graduates trained in the area have the tools and mindsets necessary to generate novel evolutionary hypotheses. Summary of Curricular Innovations: The faculty have pioneered UG Research Capstone courses, web-based courses, computer-assisted learning, and other innovative techniques. LIFS implemented a GenEd capstone series to make UG research an experiential learning opportunity, recorded on the student's transcript. The capstone experience requires the students to write a research proposal, conduct the research project, and present the results at a scientific meeting. LIFS was among the first to develop and offer web-based courses. As mentioned earlier, LIFS has the only web-based GenEd Fundamentals science courses including a laboratory approved to fulfill GenEd requirements. This course is well subscribed and attracts students nationally and internationally. LIFS provides web-based UG and G pathophysiology courses to support the DE Nursing degree programs. Teaching Effectiveness: The mean SIR value for Q40 (quality of instruction) was 3.71 relative to the ISU average of 3.92, which reflects the increased level of difficulty (Q37) of LIFS courses as 3.54 relative to the ISU average of 3.30. This is also reflected in students' expectation of final grade which is lower in LIFS than the ISU average (Q45: LIFS =3.6 (B) vs. ISU=2.89 (A-/B+)).

### Course Scheduling/Enrollment Management

#### **How is the department making sure that students are able to get the classes they need to graduate in a timely manner?**

The Department has maintained its course scheduling in a manner commensurate with the demand and requirement of different student populations served. On occasions, Lifs' faculty consult with other departments such as Chemistry or Math to facilitate students' access and enrollment in classes they need. A primary concern in scheduling is that Life Science majors who include many

pre-professional students and require the core curriculum can graduate in a timely fashion. To ensure retention and instill interest of undergraduate students in the various concentrations within the Life Sciences Department, a survey of students was performed during Spring 2004. About 87% of the respondents indicated that the new concentrations increased their interest in pursuing a Life science major and that they have no scheduling conflict in furthering their educational goal.

## Outreach

### **What are the outreach opportunities for your discipline? (non-traditional modes of delivery and timing, etc)**

The Department of Life science caters to the need of students who are either disadvantaged or non-traditional. To address concerns of these students we have intra-departmental tutoring system employing bright upper-level undergraduates or sometime graduate students who plan to be teachers. Non-traditional students are served by the online courses offered by the department. This student population includes a very significant number of students outside the boundaries of the state of Indiana. In addition, the faculty of Life Science look into other outreach opportunities to deliver courses or make life Science programs known to communities at-large. Some of the initiatives are listed below: Morocco Initiative. The Department of Life Sciences has a continuing involvement in President Benjamin's Morocco initiative. There have been faculty visits between Life Science faculty of Hassan2University in Mohamedia (H2UM) and faculty at Indiana State University. Last year Dr. S. Ghosh discussed the possibility of a joint collaboration with the President and vice-president of H2UM, visited Morocco universities and wrote a joint proposal on "Effect of environmental factors (hydrocarbon exhaust particles) on inflammatory responses in tissue-resident macrophages, and its possible remediation with Moroccan endemic plant products (MEMPP)." Dr. Toufiqr Fechtali, of H2UM, a neurobiologist, spent two months at the Dept. of Life Sciences doing research on this project to develop preliminary data. A graduate student, Youssef Aachoui, initially funded by President Benjamin from the Morocco Initiative of ISU joined the Department as a Master's student and graduated. This student presented his research at the Research Showcase and the Sigma-XI conference in 2005. He was awarded second place at Sigma Xi. This student is in our PhD program and is expecting to graduate in four years. Further collaborations and possibilities for of extramural funding are being explored. Distance Learning. Distance Learning is an important initiative for the University and for the State of Indiana. Distance Learning provides educational opportunities for time- and place-bound non-traditional students. DL provides opportunities for certification of teachers, and allows for updating the educational experiences of the workforce in Indiana. DL opportunities provided by the Department support the State of Indiana's Life Sciences Initiative. Members of the Life Sciences Department have been responsible for all of the Distance Education courses offered by the previous Life Sciences Department. These faculty have been involved in Distance Learning since its inception at ISU. Approximately twenty-four courses have been developed as Distance Learning courses for the department. These courses have been highly successful as indicated by course enrollments that have ranged from 150 to 300 students each semester, including the summer terms. The Department of Life Sciences has an opportunity to expand Distance Learning opportunities for our students. The department would like to develop a non-thesis master's tract for Distance Learning. Currently, members of the department offer 6 courses at the graduate level. Additional graduate level courses can be offered. This expansion is possible through the IHETS video delivery initiative. Through this system, we can deliver classroom-based courses to the desktop of Distance-Learning students. The non-thesis master's expansion would allow students currently in the workforce to increase the depth and breadth of their professional knowledge. Clearly, this department initiative would provide strong support for the State of Indiana Life Science Initiative. Workshops. Faculty of the Department of Life Sciences have been active in workshops for curricular and professional development. During the period covered by this report, 80% of the faculty of the restructured Department of Life Science



participated in one or more workshops. During March of 2004, members of the Department of Life Sciences served as host for a BEDROCK (Bioinformatics Education Dissemination Project) Workshop: "Evolutionary Bioinformatics: A BioQUEST Curriculum Consortium Approach". The workshop attracted 37 faculty participants from colleges and universities across the U.S. Six faculty members of the Department of Life Sciences participated in this workshop. During Fall 2004, Dr. Hughes participated in the McGraw-Hill Non-Majors Symposium, and recently (2007) published two papers in pedagogy. This 3-day symposium which involved faculty from across the United States provided curricular development for delivering science to non-majors, especially those in large courses. We plan to hold similar workshop in future.

### Assessment

#### **Please share your stated student learning outcomes.**

LIFS is committed to meeting its assessment goals as stated in 1) Student Outcomes Assessment Plan (draft May 2, 2005) BA/BS in Life Sciences, 2) Student Outcomes Assessment Plan (draft May 2, 2005) MA/MS in Life Sciences, 3) Student Outcomes Assessment Plan (draft May 2, 2005) PhD in Life Sciences. A formalized undergraduate tutoring program is slated for implementation. We plan to determine the potential benefits of creating such a program. Many of our undergraduate service courses (e.g., nursing anatomy, physiology, microbiology, human biology for general education students, etc.) could gain significantly from a more formal tutorial program involving our graduate teaching assistants or undergraduate work-study students who have excelled in the courses during previous semesters. LIFS undergraduate majors graduating in 2005 and 2007 have gone on to professional schools such as IU School of Optometry, IU School of Medicine, Ohio State School of Medicine, Purdue Veterinary College, Logan School of Chiropractic Medicine, and St. Elizabeth School of Medical Technology. Other students have gone on to pursue advanced degrees at universities, such as Emory School of Public Health, ISU Department of Life Science, and Cornell University, or are employed in industry, including at companies such as Pfizer, Lilly, and Boehringer-Mannheim. Many of doctoral graduates are now in big-name school. Dr. So-Yon Lim, who published seven peer-reviewed papers as a doctoral student and did seminal work in immunology, is now a post-doctoral research associate at Harvard Medical School doing cutting research in developing AIDS vaccine. Dr. Vince Formica is now an Assistant Professor of Biology at Gettysburg College. Dr. Rosalin Waworuntu is employed in a Biotech company in Louisville, Ky. And the List goes on. There is no better assessment of the quality of the Life Science than the ability of its graduates to have gainful employment in prestigious organizations.

### **Strategic Initiatives**

#### Community Engagement I

#### **Please summarize your faculty's efforts in community engagement this year.**

The Department of Life Science does provide the following at the community level: (1) We do have researchers who work on local problems, such as soil ecology, acid mine drainage and bioremediation. Drs. McLean and Dannelly involve undergraduate and graduate students in understanding these environmental issues. (2) We attend seminars and workshops at local schools as judges for science Fair and at Indiana academy of sciences. Our students present their research at regional meetings. (3) The graduates of Life Science are the source of skilled manpower in the region providing technical know-hows to local community colleges and industries such Ivy Tech, and Lilly/Pfizar etc. (4) Many of the faculty serve as technical consultants for Terre Haute Mayor's office or industry

#### Experiential Learning

## **What is your vision for experiential learning in your department?**

Experiential learning is a fundamental part of all science activity. Especially in basic and applied research in the field and laboratory environments. Students are involved in hands-on learning in teaching and research laboratories. These experiences provide students with real-life involvement in scientific investigations. Undergraduate and graduate students are provided opportunities to present the results of their research at local, state, regional, national and international scientific meetings as well as the ISU Research Showcase and the Sigma-Xi Research Competition. The newly established Tri-Beta chapter will provide undergraduate students with additional opportunities to present and receive peer review of their research. Capstone Experience. Dr. Dannelly has been instrumental in the development and implementation of the undergraduate Research Capstone program reaches the goal of integrating undergraduate and graduate education. We believe that "older", more knowledgeable students are expected to share information with the newer students. The Research Capstone is the epitome of this concept since research is the common string that ties the programs together. For the undergraduate, the Research Capstone offers a learning experience involving interaction with the professor and graduate students/postdoctoral fellows in the laboratory. Most important, the Research Capstone provides undergraduates with the opportunity to experience discovery first hand. We believe the student will find this to be the highlight of his/her college careers - where he/she learned what science is all about.

### Fundraising Activities

## **What steps have you taken to support fundraising activities in your department? How can your efforts be supported?**

Alumni Support. The department is in the planning stages for the development of a newsletter to renew and increase interactions with alumni of the department. Alumni of the department hold a vast array of positions in industry, private business and government. The department has long ignored the alumni who could provide an invaluable resource for internships for our students; consultants for focusing curricular development which would provide our graduates with educational experiences that will enhance their employment opportunities; and for donations of equipment, services, and scholarships which will benefit our graduate and undergraduate students. ISU Capital Campaign. The department has been involved in the discussions concerning the ISU Capital Campaign. We are optimistic that the campaign can provide opportunities to stabilize the budgetary picture in a number of areas such as scholarships, updating major equipment, and equipment maintenance.

### **Quality**

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## **Please provide 1-2 suggestions to increase the ability of your department or the University to meet the criteria above.**

Program prioritization has been initiated. This has trimmed many of our programs. We have been short on faculty, even though the Department of Life science generates second highest SCH in the college. In 2006-2007, in spite of lower enrollment we relatively met our SCH goals in Life Sciences. Due to faculty attrition, it has become increasingly difficult to meet the number targets and still provide the breadth of courses require by our undergraduate and graduate students. The department is currently functioning with an interim chairperson who is valiantly trying to maintain his research program while juggling teaching and administrative duties. Recently, the department has lost two essential faculty members: 1) a molecular physiologist, due to death from cancer, and 2) a developmental biologist, due to resignation. The faculty members formerly in these positions taught large numbers of students and covered courses which are essential for programs within Life Sciences. On a note of optimism, the department has recently succeeded in recruiting a new faculty

Dr. Allan Albig from the University of Colorado. He, a molecular physiologist, will join in fall of 2007, and brings along a seminal research credential. This will tremendously boost the quality of our program and our ability to attract extramural funding. We are hopeful that other critical vacancies will be filled in the immediate future.

### Feedback

**This section is to allow you to share your ideas for enhancing enrollment, dealing with budget and other challenges facing the university community.**