

COMPREHENSIVE PROGRAM REVIEW SELF-STUDY

FOR THE

B.S. PROGRAM IN BIOTECHNOLOGY

Prepared by

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**COMPREHENSIVE PROGRAM REVIEW EXECUTIVE SUMMARY
FOR THE
B.S. PROGRAM IN BIOTECHNOLOGY
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Conclusions About the Program's Quality and Productivity

The overall quality of the Biotechnology program at Kennesaw State University is assessed to be Strong or Above Average. Our curriculum is comparable to that found in other institutions both within and outside of the state. We have a very strong faculty who are able to teach a number of different courses relevant to students in this program. Our dedication to advising is excellent. The Cytogenetics track of the program is accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) and is the only program of its type in the Southeast. The quality of our resources is good despite a university investment that can only be considered weak to satisfactory (see Sections II-C and II-D for a detailed analysis). The intense efforts of the Dean of the College of Science and Mathematics, the faculty of the Department of Biology & Physics and the Provost to secure additional resources through grants, donations, gifts, and matching funds, and the wise investment of limited funds, has provided the opportunity to secure resources necessary to support this degree program. The existence of equipment such as a gene sequencer and PCR equipment allows us to prepare our students on state-of-the-art equipment such as they will encounter in their future employment. However, classroom and laboratory space (both for teaching and research) is much less than what is needed. The paucity of space means that we cannot expect substantial growth in this program until a new laboratory building is obtained.

Productivity of the program is assessed to be Satisfactory. While we are considered below the required number of graduates for the period of this review, we have exceeded those numbers in 2007. The cost of this program is relatively high due to the high (and continuously rising) cost of the laboratory supplies and equipment necessary to deliver a high-quality program in an expanding field of science. Finally, the flexibility of the program's course structure (see Section I-Program Overview) provides opportunities to make programmatic changes as deemed necessary. The fact that we have modified this program three times since its inception shows that we are responsive to the needs of our students and other stakeholders. Furthermore, these curricular changes have improved the quality of the biotechnology degree program.

List of Recommendations for Improving Program Quality

Recommendations for improving program quality include, but are not limited, to the following:

- Support for a new laboratory building is essential to improving the quality, and increasing the number, of courses offered in this program.
- Continue to hire high-quality faculty with strategically determined expertise.

- Continue to seek extramural funding to supplement the state-allocated budget in order to increase the quality of our facilities and equipment.
- Continue to develop Directed Study & Internship opportunities for our students because it is nationally recognized that the best way to “learn science” is to “do science”.
- More closely monitor our graduates in order to determine if our program is meeting their needs upon employment or upon entrance into graduate/professional programs.

List of Recommendations for Improving Program Productivity

Recommendations for improving program productivity include but are not limited, to the following:

- The addition of more space and faculty will allow us to increase the number of courses offered which will, in turn, aid in improving retention, progression and graduation.
- Continue to monitor our course structure and course offerings to provide an attractive program that prepares students for their subsequent career goals and to offer those courses on a schedule that permits the timely progression of our students through (and eventually out of) our program.
- Continue high-quality personal advising for our students and provide up-to-date and easily understood advising tools in hard copy and on the departmental web site so that students can effectively plan and monitor their own progress through the program.
- Continue enrollment management practices that will allow us to maximize credit hours generated while maintaining the integrity and quality of the program.

Conclusions About The Program’s Viability at KSU

The overall assessment of the program as “Strong or Above Average” indicates that the program is viable. We are the only undergraduate program of its kind in Georgia. Since its inception, the number of majors & graduates has continued to grow. There is a growing biotechnology industry in Georgia and in the nation which will need students with a background in biotechnology. As this industry continues to grow in Georgia, KSU will be in a good position, especially within the Northwest crescent, to supply an educated workforce to industries attracted to the area

Potential for Mission-Driven Model Program Status

Clearly, the Biotechnology program is of strategic value to KSU and closely fits the mission of the institution. As the first program of its kind in Georgia, it also has the potential for meeting many of the criteria indicated for a “Model Program”. Several faculty are regionally and nationally recognized which provides some degree of that recognition for the program itself and the potential to expand that recognition. It is

exemplary in that it provides a solid foundation of biological principles upon which students can superimpose specific, career-oriented specialization.

Summary Recommendation and Supporting Rationale

The overall recommendation for the program should be to **Enhance or Expand** program opportunities. The primary mechanism for doing this will be strategic hiring of high-quality faculty who have the potential to gain national recognition for their scholarship and for the program itself and judicious investment of resources to provide high-quality, state-of-the-art equipment for our students to use to increase their competitiveness for jobs and for admission into graduate/professional programs. As the field of biotechnology grows, KSU will be well positioned to be a player in the field.

**COMPREHENSIVE PROGRAM REVIEW
DETAILED SELF-STUDY – BS in BIOTECHNOLOGY**

Ronald H. Matson

27 February 2008

I. Brief Program Overview

A brief overview statement about the program under review including its date of origination at KSU, purpose, general curriculum structure (do not include the detailed listing of requirements that can be found in the catalog), tracks or concentrations (if any), program accreditation (if available), centrality to the university's mission, strategic plan, and noteworthy relationships with other KSU programs and/or community partners.

The BS in Biotechnology program, the first undergraduate program of its kind in Georgia, became effective in January 2003 with the first BTEC course being offered in Summer 2003. It remains the only undergraduate biotechnology BS program in the state (although UGA has an "Applied Biotechnology" program). The biotechnology program fits into KSU's mission of providing professional academic programs that emphasize the application of knowledge within a liberal arts environment that serves the needs of Georgia. The program of study was designed to meet growing national, regional, and state needs in different areas of biotechnology with an emphasis on the part of biotechnology that deals with genetics and molecular biology. Requirements for this degree are designed to provide graduates with a solid conceptual foundation from multiple disciplines as well as practical laboratory skills. Students are required to take all introductory biology, chemistry and math courses as well as a set of courses designed specifically for biotechnology (e.g., Biotechnology, Quality Control). However, completion of this degree will also result in the graduate having sufficient basic scientific knowledge to pursue advanced graduate or professional degrees. There is no national or regional accreditation available for this program. However, the Cytogenetics track of the program is accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) and is the only program of its type in the Southeast. Our current accreditation is valid through April, 2011.

Since its inception, the program has continued to grow. According to the KSU Factbook (http://vic.kennesaw.edu/fb/fb2007.aspx?secid=acd&pageid=acd_120&subid=maj), the number of majors has grown 160% between Fall 03 and Fall 06. While the actual numbers of students is relatively low, this trend is indicative of where the biotechnology program is going.

[NB: In the following assessment, it is often difficult and/or impractical to separate equipment, faculty, budget etc. for the biotechnology program from the biology/biology education programs. Some of the comments below are essentially the same as appeared in the Biology CPR. As all majors share a common Area F, as there is overlap in courses required in all majors, and as all faculty (including the physics faculty) contribute in

some way to the biotechnology program, several of the following answers are based on data for the entire department and not just the biotechnology degree program.]

II. Summary Conclusion about the Strength of the Program's Overall Quality

Summarize the strength of the program's overall quality and cite any detailed analyses, interpretations, or rationales that support this summary judgment. This summary conclusion should be consistent with the pattern of strengths and weaknesses observed among the indicators of program quality that follow.

The overall quality of the Biotechnology program at Kennesaw State University is assessed to be Strong or Above Average. Our curriculum is comparable to that found in other institutions both within and outside of the state. We have a very strong faculty with a broad representation of the various subdisciplines within the field of biotechnology. The quality of our resources is average (see Sections III-C and III-D for a detailed analysis). The intense efforts of the Dean of the College of Science and Mathematics and the faculty of the Department of Biology and Physics to secure additional resources through grants, and the wise investment of limited funds has provided the opportunity to secure resources (e.g. an automated DNA Sequencer & Genetic Analyzer) that are usually found at major research universities but seldom found at institutions whose primary mission is undergraduate education. Their existence here allows us to prepare our students on state-of-the-art equipment such as they will encounter in their future employment. However, classroom and laboratory space is less than what is needed. Current space will only meet current demands and will not provide enough classrooms & laboratories to accommodate future growth.

A. Curricular Adherence to Quality Program Guidelines and/or Accreditation Standards in the Discipline

First, state your assessment of the strength of the evidence of program quality on this particular indicator. Then identify how and to what degree KSU's program adheres to or exceeds the curricular guidelines and/or accreditation standards for quality programs in this academic field of study. List supporting evidence or examples. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: Strong

Analysis: There are no national accrediting standards for the Biotechnology major, but the KSU Biotechnology major compares well to similar programs offered elsewhere (e.g., [Indiana University, Bloomington](#); [Penn State](#); and, to some extent, [Cal Poly Pomona](#) and [UGA](#)). As in these other programs, our students have a strong background in chemistry, math and physics. Most programs have some sort of "core" biology courses that all degree recipients are required to take. This includes two or three lower division biology requirements and eight to ten upper level courses. Almost all programs (including KSU's) require students to take genetics plus several other courses. There is always some flexibility built into the program to allow students to pursue electives of their choosing. The biotechnology program at KSU, like programs at most other institutions,

requires our majors to take a year of general chemistry and a year of organic chemistry as well as a year of physics. The KSU program requires majors to take both calculus and statistics as well as a quality control and/or bioethics course. According to the U.S. Department of Labor Employment and Training Administration “*Because biotechnology is not one discipline, but the interaction of several disciplines, the best preparation for work in biotechnology is training in a traditional biological science, such as genetics, molecular biology, biochemistry, virology, or biochemical engineering*” (http://www.doleta.gov/BRG/Indprof/Biotech_profile.cfm). Our program provides the training so suggested.

Opportunities for Program Improvement: Effective Fall 2008, the Biotechnology degree program is being modified to strengthen the degree by requiring more science courses (which requires eliminating some possible electives) in order to provide a more meaningful degree given expectations in the biotech industry. Furthermore, some changes are a consequence of other curricular changes dealing with retention and progression issues. The justifications for these proposed changes are:

- 1) Biol 2101 is being deleted because 1) it has not proved as effective as we hoped in increasing retention in our degree programs and 2) it is creating a bottleneck that is impeding our ability to offer upper-level courses (which, in turn, decreases progression of students through our programs). In order to accommodate this deletion, we’ve moved the second physics course (Phys 1112 or 2212) into Area F and adjusted the hours accordingly. Physics 1112/2212 are already required in this degree program, so this only changes where these courses fit in the program.
- 2) We have made changes in the required courses whereby Biol 4486 and Btec 3400 are choices (students choose one) versus both being requirements in the current program. This is being done to provide additional flexibility in the program and to improve progression through the degree program.
- 3) The change in Btec 4100 is simply a title and description change. These changes better reflect the content of the course and make it more obvious to students, employers and graduate schools what is actually covered in the course. The addition of bioinformatics in the description of this course is also important as this area of biotechnology is becoming increasingly important.
- 4) Btec 4110 is a new course. Global Biotechnology-Study Abroad is designed specifically for study abroad courses which were previously offered as Btec 4100. This change helps us to emphasize the global nature of the biotech industry and provides a better way to offer our study abroad courses than offering them as Btec 4100. This change is being made because Btec 4100 offered on campus has more lab experience in it than can be offered when taught overseas. The students in Btec 4110 are getting a different experience than what they get in Btec 4100.
- 5) Btec 4310 is being added for those students in the Cytogenetics track. This track requires a minimum of hours of internships. This course is being added to reflect the realities of the work experience that is necessary for a student on this track. Enrollment in this course will be limited to students who have been accepted into the Cytogenetics track and placed at an approved internship site.

- 6) Some non-science courses are being eliminated as possible electives. This is being done because we have found that employers and graduate schools do not look upon these as “value added” to the degree. To be competitive, biotechnology majors need more science-content based courses.
- 7) The rationale for the courses in the various areas of the program is the same as before. Although it may appear that there are major changes in this program, in reality these changes do not represent a substantial change. Most of the courses in the elective area in the new version are found in the old. We are simply re-organizing the way the electives are being presented. This is being done to order to facilitate advising.

B. The Quality of the Faculty Supporting the Program

First, state your assessment of the strength of the evidence of program quality on this particular indicator. Then, assess the degree to which a quality program can be supported by the current number, specializations, qualifications, and accomplishments of the full-time faculty. Comment also on the nature and magnitude of the contributions of part-time and adjunct faculty to the program’s quality. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: Very Strong.

Analysis: All of the faculty who teach in this program are highly qualified scientists and teachers. Currently, the department has 37 faculty lines filled with 33 of these faculty having terminal degrees (Ph.D., Ed.D. or M.D). All of these faculty contribute in some way to the biotech program, although only a subset (11) routinely teach upper-level biotechnology courses. In 2004, we were successful in filling the Neel Distinguished Chair of Biotechnology with a replacement hired in 2006.

Only one of our part-time faculty has taught a course in the Biotechnology degree program. This faculty member holds a Ph.D. and has industry experience. He was very well qualified to teach the Quality Control/Quality Assurance course and provided a perspective that our other faculty could not give.

The Biology/Physics faculty have a strong record of publishing and presenting at professional conferences. A list of recent publications and presentations can be found here: <http://science.kennesaw.edu/biophys/facpubs.htm>

Opportunities for Program Improvement: Hiring a molecular geneticist is our number one hiring priority in FY 09. This position is needed in order for us to further modify our curriculum. The person filling this position will teach Molecular Genetics as well as Biol 2107 and other courses in the Biotechnology program. We have intentions of asking for several other faculty lines targeted towards supporting the biotechnology program in FY 10 and FY 11. Continuing to provide start-up funds will also be crucial to our success in attracting new faculty.

C. The Quality of KSU Facilities, Equipment, Learning Support Resources, & Practicum Placements Supporting the Program

First, state your assessment of the strength of the evidence of program quality on this particular indicator. Then, comment on the current and projected (next five years) condition, age, size, and sophistication of the facilities, equipment, and learning support resources available at KSU to support a high-quality program. Programs that require field-based practica should also report the strength of practicum sites and field-based learning experiences. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: Satisfactory to weak.

Analysis: I will address this in three separate areas.

A) *Facilities & Equipment:* The department of Biology & Physics is located, along with the departments of Chemistry, and Computer Science, in a 120,000 ft² science building that was completed in 1996. The department has regular use of two classrooms in the building (48 students/room). The department shares a 200 seat auditorium in the building with the other departments in the College and with Special Events. Classroom space in the building is obviously insufficient for the courses taught, and Biology/Biotechnology classes are also taught in KH 1104 and sometimes elsewhere. Although the Clendenin Computer Science Building provided much needed new classroom space, we are limited as to how many courses we can teach because of the necessity to share classrooms with other departments. As noted in the KSU Master Plan (http://www.kennesaw.edu/fplanning/images/Master_Plan/III_Existing_Campus_Conditions.pdf), we are very efficient in using our space, but this efficiency has caused problems. For example, to get this high efficiency measure, we have increased class sizes and/or have utilized rooms at all hours with little time between use. This “efficiency” negatively impacts on our ability restock labs, to attract and retain faculty as well as on safety (see KSU Master Plan for more details).

One of the major challenges for the biotechnology program is to provide space and up-to-date equipment to support the lab intensive nature of the program. The department has 6 laboratories (20-24 students/lab) that are dedicated to teaching labs for Biology & Biotechnology majors. Only one teaching lab (SC 364) is dedicated 100% to the biotechnology program. The department has eight “project” (research) laboratories that are used for Student and Faculty Research projects; four of which are primarily biotechnology labs. Most of these research labs are shared by two or three faculty who often have 2-4 students working with them. The number of faculty and student research projects has increased since the programs inception and the demand for project labs is expected to continue to increase during the next 5 years. With regards to space available for the

biotechnology program, we should be rated as very weak. We are doing well in terms of equipment and the quality and use of the little space we occupy.

The department also has greenhouse (20' X30'), three lab prep rooms, two equipment rooms (shared with Chemistry) and one specimen room. Students in the Biotechnology program also have access to an Open Computer lab in the building equipped with 40 computers, scanners and printers.

B) *Learning support:* The department has one laboratory safety office (Dale Zaborowski) who oversees the work of the laboratory coordinator and student assistants. The lab coordinator is responsible for coordinating all laboratories offered by the department including labs for Service courses and Science Education. The lab coordinator is responsible for lab inventory, upkeep of equipment and placing orders for laboratory equipment and supplies, and also supervises lab assistants. Laboratories taught by the department are also aided by student assistants. Student Laboratory Assistants provides an additional 3500 person-hours for students to help with lab set-up and clean-up. The lab coordinator and lab assistants help faculty to focus on laboratory instruction, however with the current level of assistance, faculty still spend a significant number of hours outside of lab instruction setting up laboratories. Two Technical System Support Specialists who work for the College of Science and Mathematics also support the Biology program. The System Support Specialists are responsible for maintaining the Science Server, installing and trouble shooting technology for classrooms and labs, and for resolving computer problems for Faculty. Although the current technical support staff is excellent, they are already overextended. Given the growing emphasis on technology, the program will need to increase the number of technical support staff.

C) *Practicum Placement:* While we do not have a required “practicum” for this degree, we do encourage and support student’s participation in directed study and/or internship experiences. Yet, in spite of this, the faculty continue to support directed study students. Btec 4400 (Directed study) courses were first offered in Spring 06. Since that time, 24 students have enrolled in these courses. While not required as part of our degree program, we do encourage students to avail themselves of these research opportunities. Furthermore, we also encourage students to work on internships at outside agencies (e.g., CDC, CSI). Between Summer 06 and now, we’ve had 14 students participate in internships. The Cytogenetics “program” does require the students to participate in an internship. All internship sites are approved by NAACLS.

Opportunities for Program Improvement: The Department of Biology & Physics has outgrown our facilities and they are a limiting factor on the growth and improvement of this program; the biotechnology program cannot expand without an additional lab building. We plan on having a new lab building by 2012; funding for this building should be available in FY 2010. This new building is absolutely necessary if we are to continue to build the Biotechnology degree program and to improve RPG. With the help of Bob Wise, we are working to develop a more formalized relationship with the CDC in hopes of increasing internship opportunities for students (see Briefing Summary notes). As our programs expand (including the possibility of moving some courses into the

Health Science building) we will need to hire additional laboratory staff to support the courses taught and research carried out by the faculty.

D. The Quality of the University's Annual Financial Investment In the Program's Operation and Growth

First, state your assessment of the strength of the evidence of program quality on this particular indicator. Then, comment on the nature and magnitude of the annual financial investment available to support the program's operation, growth, and success. In addition to annual funding for travel and supplies, comment on the availability of funding for new faculty positions with appropriate salaries to accommodate growth, quality enhancement, and competitiveness. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: Weak

Analysis: There were no additional funds allocated when the program was instituted. Budget support for equipment and supplies is grossly inadequate. The official equipment budget for this department (not program) is \$10,000, an amount that has remained constant for at least the past 15 years. Fortunately, in the past, we were able to get additional equipment with matching funds and/or through support given by the Dean and/or VPAA. Furthermore, we instituted lab fees in Fall 2003. These fees have helped us support all of our programs, including the BS in Biotechnology. These student lab fees allow us to purchase supplies for labs as well as upgrade equipment. Our current situation is good and we are able to maintain the equipment we have. However, growing the program will be very difficult if not impossible to do without additional funds. For example, up until now, we have been able to support all requested faculty travel to meetings. This will become problematic as the number of faculty increases but travel funds remain static.

Opportunities for Program Improvement: The opportunities are limited due to budget constraints. Faculty continue to procure funding from both internal and external sources and their efforts are being acknowledged in terms of Tenure & Promotion. As we hire more faculty, additional funds need to be added to the department budget to support travel for the new faculty. Hiring another faculty member to support the biotech program is the number one hiring priority for FY 09. We are encouraged that a new lab building is the number one priority in FY 10.

E. Use of Advanced Technology for Program Delivery and Support

First, state your assessment of the strength of the evidence of program quality on this particular indicator. Then, describe the condition and integration of technology resources used in the operation of this program, especially advanced instructional technology. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: Strong

Analysis: The vast majority of the department's faculty is engaged in the use of advanced instructional technology. For example, all faculty use presentation technology (e.g., Microsoft PowerPoint) in their courses, and most use content from the Internet and communicate electronically with their students. Over the past three years, we've added flat panel monitors connected to computers in several different labs. Some of the classes (e.g., Bioinformatics) utilize discipline-specific software programs. The survey also found that faculty were using many different types technology resources in their classes, such as course management software (e.g., Web Vista). This indicates that the vast majority of faculty are utilizing the technology made available to them in the classroom, and are taking advantage of the educational benefits it offers.

Very importantly, we have added more equipment (e.g., PCR equipment, gene sequencer, centrifuges, microscopes, stomacher, pipettors, incubators, etc.) to appropriate labs. As biotechnology is a lab intensive discipline, we've had to do continue to increase the number and types of equipment to which our students are exposed. Thanks to the laboratory fees, as well as support from the Dean and Provost, we've been able to add more equipment to our labs.

Opportunities for Program Improvement: We continue to upgrade our equipment as funds become available. Faculty are asked twice a year to supply the chair with a "wish list" of the equipment they need. Based on these requests, as well as on the amount of money available, new equipment is purchased as quickly as possible. We also need to continue to upgrade computers and related equipment in laboratories, classrooms and faculty offices.

F. Quality of Program Advising, Enrollment Management & Student Services for this Program

First, state your assessment of the strength of the evidence of program quality on this particular indicator. Then, describe the quality of program advising, enrollment management for the program, and any student support services specifically designed to support the program's majors. List evidence documenting the effectiveness of these activities. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: Very Strong

Analysis:

A) Advising: Personal advising of students is one of the strengths of our program. One person, Ms. Debra Phillips, acts a major advising resource for faculty and students. She advises almost all incoming students, attends orientations and PREVIEW sessions. Once students declare biotechnology major, they are assigned to a specific advisor based on the student's interest (e.g., cytogenetics, general biotechnology). Every student is

encouraged remain in contact with their advisor throughout the student's academic career. Dr. Estella Chen, is the internship coordinator for biotechnology/molecular biology and Dr. Xueya Hauge is the coordinator for the cytogenetics track. Several of the faculty have been nominated and/or won awards for academic advising at the College and University levels. Besides individual advising, several faculty are advisors to student organizations (Tri-Beta, American Medical Students Association). We also have a strong faculty-mentor relationship with a number of our students who pursue directed study research opportunities. Dr. Saunders Jones was the recipient of the 2006 College of Science & Mathematics Advising Award.

Resources are also available for faculty members to assist them when advising students. For example, we have a student internship reference guide that provides information for faculty to advise students who express an interest in doing an internship.

B) Enrollment management: We have a two-year tentative schedule that we follow. This allows students to make long-term plans and helps ensure that our classes will fill. We constantly monitor class sizes during all phases of registration. We increase class size when needed, open new sections if possible and close low enrollment sections when necessary. We try to offer a mixture of classes in terms of subjects, days and times to ensure the greatest opportunities for our students.

C) Student Services: All program information is easily available to all students via a variety of sources. Besides the easy access to advisors, students can find information about the degree program and careers (*“Biological Sciences: What can I do with this degree?”*) in the form of written documents available in the department. Similar information is also found at the Student Information link on the Department homepage (e.g., <http://science.kennesaw.edu/biophys/employ.htm>). Here students can find on-line versions of our program of study, of our “Student Handbook”, of the “Employment Guide for Students” and other helpful information. We usually have a “career day” every year. Several faculty members have pages dealing with careers in biology on their personal homepages.

Opportunities for Program Improvement: In this area we will continue to do what we do, and have been doing, well. We will continue to emphasize personal advising where faculty expertise can be utilized with the greatest effect. Providing such services is what helps make our program attractive to students and will help in our retention efforts. Over the past several months we have made a concerted effort to identify our majors and to obtain contact information. More specifically, Ms. Phillips has compiled a list of student e-mail addresses and will be contacting students more frequently. In terms of enrollment management, we will continue our constant monitoring of our classes and adjusting as necessary and resources allow. As noted above, we are planning on revising Area F of the program and restructuring upper-level major's courses so as to help increase retention/graduation rates.

G. Program Opportunities for Advanced Levels of Preparation That Give Graduates Competitive Advantages

First, state your assessment of the strength of the evidence of program quality on this particular indicator. Then, describe the nature and magnitude of the opportunities provided by this program for its majors to gain advanced levels of experience and academic preparation that lead to competitive advantages after graduation. Cite, for example, undergraduate research accomplishments, honors experiences, capstone activities, co-op/internship experiences, program-related project management, team building and leadership development, portfolio preparation, notable certificate/minor combinations with the major, etc. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: Strong

Analysis: The Department of Biology & Physics offers very good opportunities to our undergraduate majors for advanced levels of preparation that provide competitive advantages as they seek careers and post-baccalaureate educational opportunities. The quality of the evidence for this ranking is strong.

Students pursuing careers in biotechnology must be able to go beyond content knowledge to application. The majority of careers and advanced educational opportunities in biotechnology require design, implementation and execution of research projects and communication of the results obtained orally and in writing. Opportunities provided by our Department for students to prepare themselves for these activities fall in two categories: Directed Studies and Internships.

Directed Studies: Students pursuing directed study and internship projects through our Department are required to prepare proposals and defend them before a departmental review committee before receiving approval to pursue their projects. Although this level of oversight is unique on our campus, it parallels the peer review process required by granting and funding agencies. All proposals must include a research component requiring collection, analysis and presentation of student-collected data. Students are free to design their own projects, but directed study opportunities are also offered in collaboration with ongoing faculty research from outside granting sources and through internal funding mechanisms within the College of Science and Mathematics. Upon completion of their project, all directed study and internship students are required to present their results at a departmental seminar. As implemented, the process parallels the types of tasks they will face if they pursue graduate studies in the biological sciences or choose to move immediately into public or private organizations involved in biotechnology.

Internships: Internships offered through our department give our students the chance to apply skills and abilities gained in the classroom while pursuing research with biologists outside our department. Internships also require a research component, but they give students the added opportunity to experience “real-world” work settings. To provide these opportunities, our department has established collaborative relationships with a

number of local and regional organizations. These include, but are not limited to, the Centers for Disease Control, Lab Corp, and the Emory Genetics Lab. Furthermore, we have one faculty member (Dr. Estella Chen) who acts as our Biotechnology internship coordinator and serves as a point of contact for students interested in general biotechnology/molecular biology internships. Dr. Xueya Hauge is the cytogenetics internship coordinator.

Given that both employers and graduate programs stress the need for employees and students that have the ability to design, implement and communicate the results of research, we feel the opportunities offered through our internship and directed studies programs give our students competitive advantages as they seek positions after graduation.

Opportunities for Program Improvement: As resources allow, we will continue to add relevant courses and lab experiences to our curriculum. We will continue to emphasize directed study and internships. As mentioned above, with the help of Bob Wise, we are working to develop a more formalized relationship with the CDC in hopes of increasing internship opportunities for students (see attached Briefing Summary notes). Dr. Chen continues to establish relationships with potential internship sites for biotech majors as Dr. Hauge is working on finding more accredited cytogenetics internship sites.

H. Diversity & Global Perspective in the Curriculum, Faculty, and Students of the Program

First, state your assessment of the strength of the evidence of program quality on this particular indicator. Then, present the evidence of the program's diversity and global perspective as reflected in the curriculum as well as the demographic characteristics of the program's faculty and students. Comment also on the program's commitment to study abroad and faculty exchanges with universities of other nations. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Common data/info sources:

Gender Distribution of Upper Division Majors and Program Graduates

Ethnicity of Upper Division Majors and Program Graduates

Nationality of Upper Division Majors

Age Distribution of Program Graduates

Gender, Ethnicity, and Nationality Distributions of Full-Time Faculty in the Department

Curricular info is program-specific.

Assessment: Satisfactory

Analysis: According to the data provided by EIM, approximately 54% of the students in this program are female and 69% are white. This compares to the overall university demographics of 60% female and 80% white. There is a higher percentage of non-US

students in the biotechnology program (21%) compared to the overall percentage at KSU (9%).

The gender, ethnicity and nationality of the 36 full-time faculty can be broken down as follows:

Gender: 14 female; 22 male

Ethnicity: 2 African-American, 1 Hispanic, 3 Asian, 30 Caucasian

Nationality: 1 Venezuelan, 2 Chinese, 1 Canadian, 1 Indian, 1 Greek; 1 Tunisian, 29 USA

Approximately 17% of the faculty are considered minority which is below the University and College average of 21%. The percentage of international faculty in our department (~19%) is a little higher than that reported for the University (16%). Furthermore, in terms of gender, the percentage of females (~39%) is below the University average of ~51%. (University data from Fall 06, KSU Fact Book).

Limiting the discussion to biotechnology, the major contribution made in terms of the curriculum has been the Study Abroad courses to India led by Dr. Achar. India is a major player in the field of biotechnology and this course affords students the opportunity to work in an Indian lab and to see first hand the advances being made in Indian biotechnology labs. As a result of the success of these programs, we have created a new course (Btec 4110 – Global Biotechnology) that will become an elective in our Biotechnology curriculum effective Fall 08.

Opportunities for Program Improvement: The entire field of biotechnology is linked globally. We will continue to emphasize this in our classes (e.g., Biotechnology 3301) as well as supporting study abroad courses. Financial support for these experiences should be increased for both faculty and students. Dr. Peterson has made increasing scholarships for study abroad an important part of the capital campaign for the College of Science & Math. Faculty exchanges, international research involvement, and study abroad courses for students need to be more actively encouraged and financially supported.

I. Endowments, Scholarships, Gifts, Grants and Sponsors for the Program

First, state your assessment of the strength of the evidence of program quality on this particular indicator. Then, comment on the magnitude and nature of existing external sources of financial support for and investment in the program, its students, and its faculty. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: Satisfactory

Analysis: We received \$500,000 from the endowed Neel Chair in Biotechnology. This position is currently held by Dr. John Salerno. These achievements are offset, however, in this category from what might have been a Very Strong rating because of low money available for student scholarships and the fact that some donations (e.g., electron microscope) have had to be declined because of lack of space.

Opportunities for Program Improvement: We continue to seek external support. Since his arrival at KSU, Dr. Salerno has been active in pursuing grants as have other biotechnology faculty. So far, he has applied for approximately \$2 million in external funding to support his research. Other faculty who contribute to both the biotechnology and biology degree programs have also submitted and/or received external funding (<http://www.kennesaw.edu/osp/FY%2007%20Submitted.pdf>;). Furthermore, Dr. Peterson has made it a priority in the current capital campaign to obtain funding for student scholarships.

J. Program Honors & Awards

First, state your assessment of the strength of the evidence of program quality on this particular indicator. Then, identify the formal honors, awards, high rankings, citations of excellence, accreditations, positive external reviews, etc. that this degree program has received over the last five years. If program accreditation is available but has not been attained at KSU, explain why. Close with the list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: NA for program; Excellent for Cytogenetics.

Analysis: We are not aware of any specific honors that are bestowed on undergraduate Biotechnology programs. Individual faculty and students have won awards (Section II.K) but no awards have been given to the program itself. As mentioned above, the Cytogenetics track of the program is accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS). It is the only program of its type in the Southeast. Because of the dedicated work of Dr. Hauge, we received a five year accreditation effective 30 April 2006.

Opportunities for Program Improvement: We will continue to see opportunities for external validation of the program. However, recognition will primarily come from individual achievements rather than honors and awards for the program. We will maintain the standards necessary to retain our NAACLS accreditation.

K. Exceptional Achievements & Honors of the Program's Students, Graduates, & Faculty

First, state your assessment of the strength of the evidence of program quality on this particular indicator. Then, identify the exceptional achievements and honors received by the program's students, graduates, and faculty over the past five years which reflect on the quality of the program. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: Strong

Analysis: The strength of the evidence here is good for students, excellent for faculty, and adequate for graduates. The differences vary directly with the availability of respondents. Faculty members are available and respond to calls for information about honors received. Student data are from irregular records kept by individual faculty and the Department. Data on graduates are based on recent contacts with a relatively small sample of graduates.

Analysis: This section has been divided into three parts.

A) Student honors include: As seen on the department website (<http://science.kennesaw.edu/biophys/studentresearch.htm>), a number of students have presented the results of their research at local, state or international conferences and several have won awards for their work. The Department coordinates awards and nominations for the following awards each year: Outstanding Biology Major, Outstanding Biotechnology major, Outstanding Biology Education major, Biology Honors Student, Biology/Biotechnology Service Award and the Tri-Beta Award. Students have received these awards each year. In addition there have been annual awards of the Cobb County Golf Scholarship award (\$500) for pre-medical students.

B) Faculty honors include: Among the faculty there is a strong record of awards, including for advising, teaching, and scholarship (see: <http://science.kennesaw.edu/biophys/facultyawards.htm>). Since the inception of the Biotechnology program in 2003, faculty have received awards as follows: *College level*- Distinguished Scholarship (1); Distinguished Teaching (1), and Distinguished Service (2), as well as several finalists for these. *University level*-- finalists in the Distinguished Scholarship (1), Teaching (2) and Service (2) areas, as well as Outstanding Academic Advisor (2).

C) Graduate honors: See Section II.N.

Opportunities for Program Improvement: Ms. Debra Phillips has created a database of information (addresses and e-mail addresses) on current students and Graduates. Approximately 75% of current students are in the database, and as they graduate, their names are kept in the Graduate database. The goal is for more effective contact with students during their time at KSU as well as after graduation. In addition, it will allow honors, further education and employment data to be kept more effectively.

L. General Success of the Program's Graduates

First, state your assessment of the strength of the evidence of program quality on this particular indicator. Then, report the results of the department's assessments of the general success of the program's graduates such as licensure or certification rates, job offers, job placement statistics, average salaries, subsequent career advancement, test

scores, admissions to post-baccalaureate programs, etc. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: Satisfactory

Analysis: Web survey conducted by Ms. Debra Phillips (see attached) indicate that our graduates from the biotechnology degree program have gone to work in the private sector and several have gone on to graduate school or medical school. Students in our cytogenetics track have also been very successful in finding jobs in that field.

Opportunities for Program Improvement: While there is evidence that many graduates are successful, the department needs to improve efforts to stay in touch with its graduates in order to better document their successes. As the economic climate in Georgia changes, and as more biotechnology businesses are attracted to the state, our students will find more employment. With the help of Ms. Pauline Jones and Ms. Debra Phillips, we have instituted career fairs and information sessions whereby students and potential employers can mix.

M. Stakeholder Satisfaction with the Program

First, state your assessment of the strength of the evidence of program quality on this particular indicator. Then, report the results of surveys of students, alumni, employers, community partners, etc. concerning their satisfaction with the quality of the program and its learning experiences and any program improvements initiated as a function of such feedback over time. Also comment on the effectiveness of the program's use of a community advisory board. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: Satisfactory to Strong

Analysis: The Department has used an exit survey of students since 1994, and results of the survey indicate satisfaction on the part of graduating students. The department might attempt to stay in touch with its graduates and their employers. (Much of the evidence in this section related most clearly to the success of internship students.). As indicated in the Biotechnology AOL report, results of student surveys suggest that student perceptions of the program's success in meeting its stated objectives is quite high.

We instituted a web-based survey to help assess the perceptions our graduates have of their KSU education. (The survey can be found here: <http://science.kennesaw.edu/biophys/GradSurvey.htm>). Debra Phillips has collated the results she has obtained as of 21 September 2007 (see attached). As of then, the number of respondents is too low to make the results useful for this document (only 4 biotech majors have responded, one thought their preparation was "fair", two thought it was "very good" and one did not answer that question). Overall, the comments made by graduates reflected favorably on our programs.

Comments made by employers are generally very strong. For example, as part of the Cytogenetics track, Dr. Hauge sends “Employer Evaluation” forms for KSU students working in cytogenetics laboratories. Numerical scores are high and comments such as “... was a superb intern. She went above the required workload” or that “We would consider hiring... for employment” are common. All of the employers responding to the survey checked the box that said “The KSU Experiential Education program meets the needs of my company and I would like to consider Cooperative Education or Intern students in the future”.

Opportunities for Program Improvement: As described in above and in the AOL report, the Biotechnology program has already initiated substantial changes as the result of assessment efforts and continuously examines and discusses instructional issues raised by assessment efforts. We are investigating ways to assess our effectiveness by surveying more graduates as well as local employers. We need to find a better way of keeping in touch with our graduates and increasing response rates to questionnaires.

N. Selectivity and Academic Achievement of Students & Graduates in the Program

First, state your assessment of the strength of the evidence of program quality on this particular indicator. Then, assess the quality of the program’s admission and retention standards and practices (if applicable), average SAT scores of majors, average KSU GPA’s of majors, distribution of GPA for program graduates, and other measures that reflect on the quality of the students attracted to and retained in the program. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Common data/info sources:

Average GPA of Upper Division Majors

Average SAT of Upper Division Majors

GPA Distribution for Program Graduates

Other information that is program-specific.

Assessment: Satisfactory

Analysis: Based on Fall 2007 data, the average GPA of Biotechnology is 3.1 for juniors and 2.96 for Seniors. The average GPA for all majors is 2.85. This compares to an average GPA of 2.86 for Biology majors and 3.14 for Biochemistry majors. The average SAT scores for Biotechnology majors is 530 verbal and 549 math. These averages are very similar to those for Biology majors (534 verbal, 537 math) and Biochemistry majors (521 verbal, 542 math). Based on these data, it appears that the students choosing biotechnology as a major are very similar to those majoring in closely related disciplines.

Opportunities for Program Improvement: Given KSU and BOR policies, our incoming students will likely continue to have similar SAT and GPA scores as those currently in the program.

O. Program's Responsiveness to Change & Improvement

First, state your assessment of the strength of the evidence of program quality on this particular indicator. Then, cite the most significant examples of improvements made in the program over the last five years in response to changing conditions, new external requirements, and/or departmental assessment initiatives. Comment on how frequently the program's faculty are engaged in program assessment activities, comprehensive program evaluations, and fine tuning of the program and its requirements. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: Very Strong

Analysis: Since its inception, the biotechnology degree program has undergone two major changes in curriculum. In 2004, after the first year the program was in existence, the biotechnology program was modified by removing the four tracks (general, forensic cytogenetics, and medical diagnostics). This was done in order to clear-up confusion about degree requirements. Students were confused as to exactly which courses they had to take. By simplifying the curriculum, it made advising a lot easier. Next, in 2006, the separate one-credit hour laboratory courses (modules) were removed and consolidated into 3 or 4 hour courses. This was done because we had neither the faculty nor the space to support these modules and that was having a negative impact on student progression. Furthermore, in 2006 and 2007, most of the separate laboratory courses were combined with the lecture into a single course. This was done to reduce confusion amongst students who often did not realize that the lab and lecture were co-requisites. Finally, as described above, major changes are being made to the biotechnology curriculum effective Fall 2008. Once again, these changes are being made to help make the curriculum more relevant and useful to the students and, at the same time to help student progression through the degree program. See II.A. for more details.

Opportunities for Program Improvement: We will continue to monitor our program and make changes in the curriculum as needed. We already have some plans for adding several additional classes (e.g., Molecular Biology and Biochemistry; Bioinformatics) as permanent classes. These curricular improvements will be made when additional faculty and space are provided to the Biotechnology program.

III. Summary Conclusion About the Strength of the Program's Overall Productivity

Summarize the strength of the program's overall productivity and cite any additional detailed analyses, interpretations, or rationales that support this summary judgment. This summary conclusion should be consistent with the pattern of strengths and weaknesses observed among the indicators of program productivity that follow.

A. Enrollment of Upper Division Majors in the Program

First, state your assessment of the strength of the evidence of program productivity on this particular indicator. Then, analyze and interpret the numbers of enrolled upper division majors in the program and the enrollment trends of these majors for the past five years. Compare the strength of the numbers of the upper division majors and enrollment trends for this program with the enrollments and trends of upper division declared majors in other undergraduate programs at KSU. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Common data/info sources:

Fall Enrollment of Upper Division Majors

Assessment: Satisfactory

Analysis: In its first year of existence, we offered 4 sections of Btec courses with 62 students enrolled. By this academic year (Fall 07 & Spring 08), we had increased that to 11 sections of Btec courses serving 176 students.

Opportunities for Program Improvement: We need to offer more courses in this program. This will be accomplished by hiring more faculty and having more lab space. In the meantime, the deletion of Biol 2101 from the curriculum will allow faculty to teach more upper-level courses. But, until we get more space, there will not be significant increases in the number of majors or in the number of courses offered.

B. Annual Bachelor's Degree Productivity of the Program

First, state your assessment of the strength of the evidence of program productivity on this particular indicator. Then, analyze and interpret the numbers of degrees granted annually (fiscal year) by this program and the trends of the program's degree productivity over the past five years. Compare the strength of the degree productivity of this program with the productivity of other undergraduate programs at KSU. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Common data/info sources:

Degrees Conferred by Program

Assessment: Weak

Analysis: As pointed out by EIM "This relatively new 4-year degree program currently exceeds the Regents' threshold criteria for declared majors, but falls below the 2007 threshold for degrees conferred (i.e., the three-year average of 10 degrees awarded per

year from FY2004-FY2006). The program can be expected to fall below the Regents' degrees conferred threshold in 2008 as well, since its three-year average for FY2005-FY2007 will continue to be less than 10 when it is not rounded to whole numbers."

We concur with the assessment quoted above. However, some context needs to be provided. While the numbers are low, we have the highest in the state. Furthermore, based on a student-interest survey conducted when we created this program, we expected that approximately 30% of the 513 biology major would choose to become biotechnology majors. Unfortunately, this projection did not hold true. Only approximately 10% changed majors. As a result, the number of majors, and hence graduates, was below what we predicted. These less than predicted numbers are probably the result of several factors including 1) an initial program that was confusing to students (i.e., the different tracks); 2) a lack of faculty and space resources needed to implement the initial program and 3) a decreased interest as the anticipated demand for students trained in biotechnology failed to materialize.

Opportunities for Program Improvement: As noted above, we have been restructuring the biotech program over the past several years. Offering more Biotech courses should help attract more students into the program. In the past two years, we've also hired several new faculty (e.g., Drs. Chen, Griffin, Lu, and Salerno) who are contributing to this program. We will continue to hire more "biotechnology" faculty to help improve course offerings and attract more students to the major.

In order to increase the number of graduates, we will continue our active efforts to retain lower division students so they continue into upper division courses and eventually graduate. This will be accomplished by active enrollment management – offering appropriate and attractive courses; strengthen our internship and directed study opportunities; use of student support fund and Mentor-Protégé fund to provide additional opportunities for students; student awards for those that do well.

C. Program Completion Efficiency & Graduation Rate

First, state your assessment of the strength of the evidence of program productivity on this particular indicator. Then, analyze and interpret the program's graduation rate defined as the ratio of the FY2006 graduates to the Fall 2005 upper division majors. Compare the program's graduation rate with those of the other undergraduate programs at KSU and offer possible explanations for this program's unusually high or low graduation rate if applicable. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: Satisfactory

Analysis: The 2007 data indicate the biotechnology degree program graduated 16 students, ranking it the fifth among the undergraduate programs from the College of

Science and Mathematics. In term of a 5 year change, biotechnology shows the second highest growth in graduates within the College of Science & Mathematics.

Data indicates that for 2007, approximately 36% take less than 12 hours per semester. While this is an improvement over the 44% of students taking less than 12 hours in 2003, it does indicate that a substantial number of students won't graduate in 6 years. Therefore, the graduation rate is consistent with the course loads taken by our students

Opportunities for Program Improvement: We will continue to do all that is possible to facilitate students in their quest to graduate within their designed timeframe while maintaining the integrity of our degree program. To do this, we will continue to offer a mixture of required classes every semester at different times. As we are offering more upper-level biotechnology courses, it should result in improvements in progression and graduation rates. We offer cross section of electives from subdisciplines as well as required classes in order to allow students the greatest amount of choice. Through advising, we will continue to encourage students to take a full-time load and to point out the advantages of taking such loads in terms of shortening the time to graduation. Ultimately, it is the student's decision as to how to juggle course load with other commitments.

D. Efficiency & Clarity of the Program's Course Requirements

First, state your assessment of the strength of the evidence of program productivity on this particular indicator. Then, analyze the published course requirements for program completion in terms of the simplicity and efficiency of the program's curricular design and the degree to which program requirements are communicated clearly and effectively. Comment on the ease with which majors understand and successfully navigate through the required curriculum for program completion. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Common data/info sources:

Published Program Requirements in the 2007 Undergraduate Catalog

Other program-specific information

Assessment: Satisfactory

Analysis: The program as described in the 2007 Undergraduate catalog is clear. Furthermore, we have advising sheets available to students both on-line and as hard copies. All advisers have access to this information and do a good job in explaining program requirements.

Our program is designed in this manner for very specific reasons. The high degree of proscribed courses is designed to provide the students with a broad foundation that includes all of the basic principles in Biology. They can then use this foundation as a springboard for specialization in one of the many subdisciplines of the field or they have the option of continuing to pursue a broad based education in Biotechnology. The

remaining upper level electives are open to student choice by design. Biotechnology has many different subdisciplines (e.g., biotechnology related to agriculture, cytogenetics, forensics, microbiology and pharmaceuticals) and students must have options open to them that allow them to pursue their own individual career goals (industry, grad school, professional school). For example, those students going on to medical school would likely choose (and in some cases are required to take) different courses than someone going to grad school or industry.

The design of our program is fairly standard for a general biotechnology program. Although specific requirements vary to some degree, all of these programs were structured in a manner similar to ours. That is, they all have a set number of required classes plus a number of Biology electives from which the students can choose. Furthermore, like our program, all these other institutions required a set number of specific courses in Chemistry, Mathematics and Physics.

In addition to our general program, the Biotechnology program does have the Cytogenetics track. This program is more efficient than the general program in that even more of the courses are proscribed. This is the result of requirements placed on this track by outside accrediting agencies.

Opportunities for Program Improvement: Overall, the program needs to remain much as it is in order to provide the greatest amount of flexibility to our students. Students need some flexibility in order to accommodate their personal goals (e.g., going to graduate school, professional school or into industry). We are continuously assessing value of program to graduates by contacting our graduates and asking for their advice and opinions. Our strategy will be to continue to monitor and up-date the program as needed (and as resources allow). These are modified as needed (see also II A above). In terms of the clarity of the programs requirements, we are very strong. Our program is clearly stated in the KSU catalog and on the department web site. We also have one-page advisement sheets that are available to both students and faculty. These sheets are easy to follow and function as a simple checklist.

E. Frequency and Sequencing of Course Offerings Required for Program Completion

First, state your assessment of the strength of the evidence of program productivity on this particular indicator. Then, analyze and interpret the scheduling and enrollment history of courses required for program completion, giving particular focus to the regularity, frequency, and sequencing of course offerings required for program completion. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Common data/info sources:

Course History by Major

Other information concerning course scheduling and sequencing is program-specific.

Assessment: Satisfactory

Analysis: This is an area to which we pay a great deal of attention. We publish and try to follow our two-year schedule making strategic modifications as necessary. We monitor recent past enrollments and determine course offerings based on observed enrollment trends. We offer courses at a variety of times in every required and elective area.

We are constantly monitoring our courses and course offerings. We continue to offer a mixture of courses for our majors, always making certain that courses required for their program of study are offered every semester. We continue to offer classes in all time slots from 0800 in the morning to 1100 at night with some courses being offered on Friday and Saturday. Over the past five years, we've offered several special topics classes (e.g., Bioinformatics, Gene Regulation) as a way of increasing the amount of upper-level courses available to biotechnology our majors.

All Biology/ Biotechnology courses required for the major (Biology 2107, 2108, 3300, 3340 and 3380; Btec 3301) are offered every Fall & Spring semester and, when possible, summer. The required courses in the physics sequences (Physics 1111/1112) are also offered every term. We offer a mixture of elective courses (including special and advanced topics courses) in order to provide our students with a mixture of course which will be attractive to them and facilitate their progress through our program.

Courses required of our majors but offered by other departments (e.g., Chem. 1211, 1212, 3361, 3362; Math 1113, 1190; Stats 3125) are all offered every term. The regular offering of these courses allows Biotechnology majors to complete their program in a timely fashion.

Opportunities for Program Improvement: By having a two-year schedule that we follow fairly diligently, our students are able to plan their program with a high degree of accuracy. We will continue to offer a mixture of required and elective courses every semester. We will add courses as demands increase and resources allow.

F. Enrollment in the Program's Required Courses

First, state your assessment of the strength of the evidence of program productivity on this particular indicator. Then, analyze and interpret the strength of the enrollments in the courses required for program completion. Comment on differences between core and elective course enrollments as well as differences among courses required for optional tracks or concentrations. Identify any required courses that are dropped from the schedule of classes frequently due to low enrollment and which majors must complete through approved substitutions or directed studies.

Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Common data/info sources:

Course History for the Major

Other information about course cancellations and alternatives pursued by majors is program-specific.

Assessment: Strong

Analysis: In its first year of existence, we offered 4 sections of Btec courses with 62 students enrolled. By this academic year (Fall 07 & Spring 08), we had increased that to 11 sections of Btec courses serving 176 students. We expect the increased enrollment to continue.

Opportunities for Program Improvement: With additional faculty and changes in program we will be able to offer more upper-level biotechnology courses/sections. However, without increased faculty and space, this growth will be minimal and, in some instances, curtailed.

G. Diversity of the Program's Upper Division Majors and Graduates

First, state your assessment of the strength of the evidence of program productivity on this particular indicator. Then, analyze and interpret the gender, ethnicity, nationality, and age of the upper division majors and graduates in the program. Comment on the program's success and distinctiveness in enrolling and graduating a diverse mix of undergraduate students. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Common data/info sources:

Demographics for Upper Division Majors

Demographics for Program Graduates

Other information pertinent to the program's distinctiveness in its achievement of diversity is program-specific.

Assessment: Satisfactory

Analysis: According to the data provided by EIM, approximately 54% of the students in this program are female and 69% are white. This compares to the overall university demographics of 60% female and 80% white. There is a higher percentage of non-US students in the biotechnology program (21%) compared to the overall percentage at KSU (9%).

Opportunities for Program Improvement: We will continue to make efforts to attract a diverse student body. We have been relatively successful in attracting women, minorities and international faculty to our department. By doing so, we provide role models for our students and help make our students feel comfortable in our program.

H. Cost-Effectiveness of Instructional Delivery in the Program's Home Department

First, state your assessment of the strength of the evidence of program productivity on this particular indicator. Then, contrast the instructional cost-effectiveness of this

program's home department with others at KSU for FY2008. List the principal factors that cause this program's home department appear to be unusually cost-effective (i.e., have a low ratio of instructional expenses per weighted credit hour of instruction) or appear to be unusually costly (i.e., have a high cost per credit hour). Comment on the degree to which this program contributes to or detracts from the cost-effectiveness of the department. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Common data/info sources:

Weighted Semester Credit Hour Productivity Tables on the Web

Other information pertinent to the program's cost-effectiveness is program-specific.

Assessment: Very Strong

Analysis: The Department of Biology/Physics generates the second or third highest weighted credit hours in the University (e.g., 17,955 in Sp 07 compared to 17, 949 for Math and 19,254 for English). Because of the relatively few Biotechnology courses offered, the biotechnology degree program is not a big contributor to these values. In terms of cost of the program, Biotechnology is relatively expensive (as are all lab sciences). The cost of equipment and supplies increases yearly. We do generate income to support the program by assessing a \$35 fee for each lab course. Furthermore, we already have some of the highest usage of space of any school in the system.

Opportunities for Program Improvement: We continue to look for ways to maximize productivity and decrease cost while maintaining the quality of the biotechnology degree program. But we are already using space and money very effectively and it will be difficult to continue to do more with our current resources.

I. Program's Responsiveness to State Needs and Employer Demand for Program Graduates

First, state your assessment of the strength of the evidence of program productivity on this particular indicator. Then, comment on the state's economic need and employer demand for graduates of this program, followed by an assessment of the program's success in responding productively to such need and demand. List the factors that limit the program's ability to be more productive and responsive to these needs and demands. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: Satisfactory

Analysis: We have made some modifications to our program based on feedback from employers. The development of Btec 3400 (Quality Control and Regulations) was a direct result of suggestions made by several people in industry. Some of the curricular changes proposed for Fall 08 (e.g., a specific course in molecular genetics) and in future terms (eventual addition of a "Molecular Biology & Biochemistry) are the result of

information we've received as to what students need when going into industry. As indicated above (II M), employers are very satisfied with our cytogenetics interns.

Opportunities for Program Improvement: We will continue to monitor trends in the field and make adjustments as resources allow. We will continue to contact leaders in the local biotechnology industry in order to assess trends and needs in this ever changing field.

J. Position of the Program's Annual Degree Productivity Among Comparable USG Programs

First, state your assessment of the strength of the evidence of program productivity on this particular indicator. Then, identify the ranking of this program relative to comparable programs in the University System of Georgia (or region or nation) in terms of the number of baccalaureate degrees granted annually. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Common data/info source:

Annual IPEDS data on degrees conferred by CIP code

Assessment: Satisfactory

Analysis: Based on the IPEDS data, we are first in the state. However, this is relatively meaningless as we've had a small number of graduates and we are really the only program of its type in the State.

Opportunities for Program Improvement: Degree productivity should increase as we offer more courses. We will continue to monitor student progress and make adjustments as necessary (See IA above).

K. This Program's Contribution to Achieving KSU's Mission

First, state your assessment of the strength of the evidence of program productivity on this particular indicator. Then, list the substantive contributions this program makes to the achievement of KSU's published statement of institutional mission. Close with a list of opportunities that will be pursued for program improvement on this particular indicator.

Assessment: Very strong

Analysis: Our program is a "professional" program of sorts that has a solid liberal arts foundation. It is a good example of an interdisciplinary program that is strategically important to the state; one that emphasizes the application of knowledge.

In particular, according to the publication *Shaping Infinity, The Georgia Life Sciences Industry Analysis* "the Georgia Life Sciences Industry Analysis 2007 reveals Georgia's life sciences industry, between 2001 and 2006, grew much faster than the average for all other industry sectors in the state. The annual report shows the number of life sciences establishments increased by an impressive 38.3 percent between 2001 and 2006,

compared to a 13.8 percent average growth rate for all other industry sectors in Georgia” <http://www.gabio.org/content.aspx?pageid=50>). This program specifically supports the KSU mission of serving Georgia by providing students who can support the growing biotechnology industry.

Opportunities for Program Improvement: As more students graduate from this program, and as more of the faculty receive recognition for their research (in terms of grants, publications and/or presentations), this program’s contribution to KSU’s mission will become more obvious.

IV. Summary Conclusion About the Program’s Viability at KSU

Summarize the program’s viability at KSU and cite any additional detailed analyses, interpretations, or rationales that support this summary judgment.

The biotechnology program is viable. We are the only undergraduate program of its kind in Georgia. Since its inception, the number of majors & graduates has continued to grow. There is a growing biotechnology industry in Georgia and in the nation which will need students with a background in biotechnology (http://www.doleta.gov/BRG/Indprof/Biotech_profile.cfm). As this industry continues to grow in Georgia, KSU will be in a good position, especially within the Northwest crescent, to supply an educated workforce to industries attracted to the area (see also *Shaping Infinity, The Georgia Life Sciences Industry Analysis*).

V. Program Improvement Plan

Highlight the department’s plans, priorities, and timetable for improving the program’s quality and productivity if the program is judged to be viable.

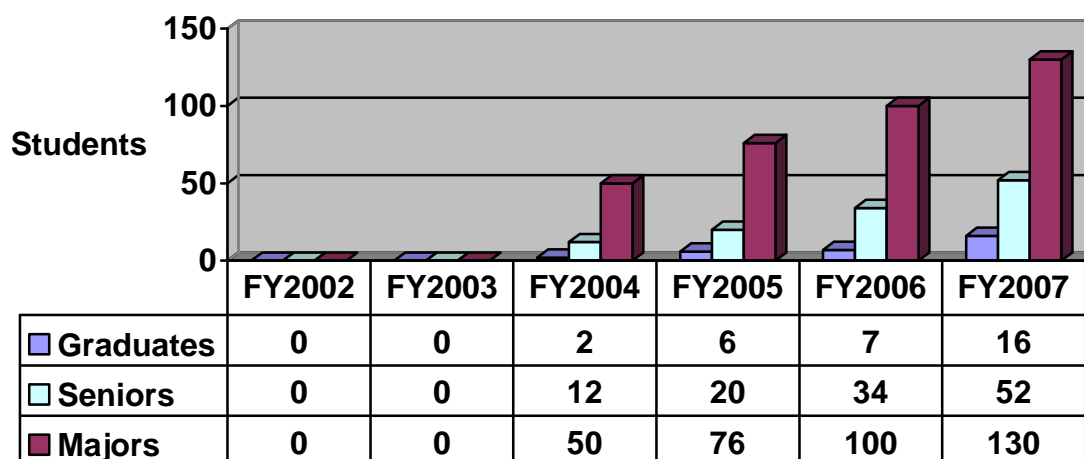
We will continue to monitor this program and the success of our students. By doing so, we can make adjustments in the curriculum as needed. To really improve this program, our first priority is to hire another faculty (molecular geneticist) in FY 09. Other faculty will also be hired in subsequent years to augment this program. With the anticipated lab building and the increase in space that comes with the new building, we will be able to offer more courses in this program. Furthermore, the additional space provided by the lab building will enable us to institute curricular changes including the addition of labs to current courses (e.g., Molecular Genetics) as well as the development of new lab courses (e.g., Molecular Biology & Biochemistry). Finally, we will continue our efforts to obtain more external funding.

VI. Summary Recommendation

Highlight the department’s recommendations, rationale, plans, and timetable for expanding, maintaining, reducing, or consolidating/discontinuing the program.

Overall, this program needs to be **maintained** and, as resources allow, **expanded**. As the Biotechnology degree program shares many of the same courses as the biology program, there are no plans to reduce, consolidate or discontinue this program. In fact, as resources allow, we will expand this program. First set of curricular changes to be made in Fall 08. These changes will improve the quality of the program and should help increase progression and graduation rates. The next major curricular changes won't happen until we hire more biotech faculty and when we have a new lab building (hopefully in 2012). Therefore, the continued hiring of high quality, research active faculty is an absolute necessity. The development of a Masters degree, which would support an increase in scholarship amongst the faculty and provide more opportunities for increased grant support, should also be considered. In the meantime, we will continue to improve the quality of the program by building on the strong foundation that currently exists.

B.S. in Biotechnology



Regents' Threshold Issue: This relatively new 4-year degree program currently exceeds the Regents' threshold criteria for declared majors, but falls below the 2007 threshold for degrees conferred (i.e., the three-year average of 10 degrees awarded per year from FY2004-FY2006). The program can be expected to fall below the Regents' degrees conferred threshold in 2008 as well, since its three-year average for FY2005-FY2007 will continue to be less than 10 when it is not rounded to whole numbers.

Notable Productivity Trends: KSU's RPG statistics confirm that the majority of the university's degree completions for FT/FT Freshmen occur within four to six years, and this relatively new bachelor's program has not yet been in existence for its first six-year cycle. Growth trends for the start-up of this relatively new degree program have been positive and substantial, in both declared majors and degrees conferred. The growth trend for declared majors in the senior classification is especially strong. If current growth trends extend into FY2008, or if they level off at the FY2007 level which does not appear likely, the program will surpass the Regents' threshold for degrees conferred in the USG's 2009 threshold report for comprehensive program review.

Additional Questions for CPR in 2007-2008: What strategies are being pursued to ensure continued growth of declared majors, the senior classification and the annual number of degree completions for the Biotechnology program in FY 2008 and into the future?

Analysis by EIM 9/18/07

Briefing Summary Notes – CDC Meeting 11/14/2007

Dean Peterson:

A joint meeting between the Centers for Disease Control and Prevention (CDC) and KSU was held on the campus of the CDC on Wednesday, November 14, 2007. The CDC participants were Sandra DeShields – Workforce Career Development Officer who chaired the meeting; Susan Hunter – Workforce Development Liaison; Audriene Bishop Cline – Public Health Advisor; and Ernestine Flint – Public Health Analyst. Janet Nicholson – CDC Senior Advisor for Lab Science was unable to attend. The KSU participants were Dr. Ron Matson – Chair, Department of Biology and Physical Sciences; and Bob Wise, Director of Development for the College of Science and Mathematics.

The purpose of the meeting was to establish ways to advance the partnership between KSU and the CDC. This meeting was an outgrowth of the Employers Showcase that was held on the campus of KSU on November 1, 2007 where the CDC was one of the participating companies. After hearing the presentation from Audriene Bishop Cline, I felt that a meeting was in order to see if we could pursue new opportunities with the CDC.

On the outset I will say that this was a very productive and informative meeting. The CDC has nothing but the highest praise for KSU due to the excellent results they have had with our students who are participating in the work study program at the CDC. They continuously remarked throughout the meeting how appreciative they were with the knowledge and work ethics of our students and expanding the role of this relationship was foremost in the CDC's mind.

Dr. Ron Matson provided an outstanding overview of the KSU curriculum as it related in preparing the students for a work study assignment. The CDC members were impressed. Dr. Matson can provide additional details on how CDC would like to expand not on the number of participating students, but also expanding the disciplines within his department and outside the College of Science and Mathematics.

Without going into a lot of the meeting details, the results of this meeting were as follows:

- Formalize the relationship between the CDC and KSU
- Increase the number of work study students
- Provide work study programs beyond food born diseases (Ron can elaborate)
- The CDC has an immediate need for Economists (provided by the Coles business school) and Statisticians
- Provide CDC marketing material which will allow the CDC to publicize this relationship between CDC and KSU
- CDC will assist in KSU's new lab design, configuration, determining the material/equipment that we need to stock and any other aspects in the creation of a new laboratory. CDC has the expertise to do this in that they have over 130 labs supporting various research projects.
- CDC will also make available members of the CDC Foundation to give KSU direction and guidance on potential sources of funding for our new lab
- CDC would also interested in having KSU faculty members share their knowledge with members of the CDC staff and to reciprocate, have CDC technicians share their "real world" projects with our students. Again, Ron can provide specifics.

Dean Peterson, I am extremely excited about this partnership and am fully convinced that this is a best world "win-win" for both organizations. Dr. Matson and I will be coordinating future meetings between the CDC and members of your staff to accomplish the above goals and desires that resulted from this initial meeting.

I will provide additional information at our meeting next Tuesday, November 20th.

Regards,

Bob Wise

BIOLOGY/BIOTECHNOLOGY GRADUATE SURVEY

| Grad Year | Degree | Earned Grad Degree | Salary Range | Type of Work | KSU Prep/Comments |
|-----------|--------|--|--------------|--|---|
| 2003 | BIOL | NO | 25-40,000 | Lab | Good |
| na | na | na | 25,000 | na | na |
| 2004 | BIOL | Yes MS Science Ed Georgia State | 40-55,000 | H.S. Teacher | Excellent |
| 2004 | BIOL | NO | 25,000 | P.T. Lab Instructor Georgia Highlands | Good |
| 2006 | BED | NO | 25-40,000 | Teaching | Good |
| 1992 | BIOL | YES Southern College of Optometry | 100,000 > | Optometrist | Very Well |
| 2005 | BTEC | NO | 25,000 | Lab Tech | Fair |
| 1999 | BIOL | NO | 55-75,000 | CDC Biologist | Very Well |
| 2000 | BIOL | Working on it | <25,000 | Grad Student | Marginally well |
| 2005 | BIOL | NO | 25-40,000 | Project Mgr Environmental Lab | prepared |
| 1997 | BED | Yes attending Adolescent Ed MS program in Science | 40-55,000 | Teaching South Cobb High | Science background fairly strong but wasn't as fluent in biology as I had hoped. |
| 2004 | BIOL | Yes attending Fort Valley State MPH program | 25-40,000 | Grad Student | No answer |
| 2004 | BIOL | YES MPH program Mercer | < 25,000 | part-time Anheuser-Busch | Experience & connections at KSU extremely valuable |
| 2004 | BIOL | NO | 25-40,000 | Vet Tech | broad background of skills & information that I apply to my job every day |
| 2006 | BIOL | YES MS Wildlife & Fisheries South Dakota State | < 25,000 | Grad Student | No answer |
| 1999 | BIOL | YES Rutgers Microbiology | < 25,000 | Grad Student genetics | Very Well |
| 2002 | BIOL | NO | na | na | na |
| 2000 | BIOL | NO | 40-55,000 | Sales never worked in biology | No prep at all |
| 2006 | BED | NO | 40-55,000 | Teaching science | Horrible because it took so much struggle to get science classes. I was flabbergasted by limited # of classes offered |

| | | | | | |
|------|------|-----------------------------|------------|---|---|
| 2005 | BED | NO | 25-40,000 | Teaching | Fairly well except advisors not helpful at all, not enough classes |
| 1997 | BIOL | NO | 55-70,000 | Environmental consulting/wetland delineation/threatened, endangered species surveys, etc | I wish we had had classes that would have taught us how to use common sampling equipment or even GPS. Wish KSU had Master's Biology program |
| 1996 | BIOL | YES MS Wildlife Biol | 25-40,000 | Lab Safety Officer at Univ. | Very Well |
| 1981 | BIOL | Attended GT didn't graduate | 85-100,000 | Computer Sciences | Very Well, I'm amazed at the number of IT professionals who have B.S. in Biology |
| 2004 | BIOL | NO | 100,000> | no info | no info |
| 2006 | BIOL | NO | 40-50,00 | Scientist I Water Resources Div. at PBS & J in Marietta. Calculate & compile stat analyses on collected data, write & revise reports, perform some field work. Projects focus on water quality. | Course work & professors very helpful. The projects I had to read & understand weren't overwhelming and I was able to understand the procedures, data analyses and the context of the reports. |
| 2006 | BTEC | UAB/MSFS (Forensic Science) | <25,000 | Graduate intern in the CODIS section at Alabama Dept of Forensic Science. | The program prepared me VERY WELL! In fact, it is causing trouble with finding appropriate courses to take for my current program--I've already taken all of them! My undergrad coursework was also the main criteria used in selection for my graduate fellowship at ADFS. |
| 1997 | BIOL | NO | <25,000 | Teacher. Spent 2 years in alternative prep program for teachers | YEAH!!! I had a wonderful background in the biological sciences when I sought a career in education. |
| 2004 | BIOL | NO | 40-55,000 | no info | Well |
| 2005 | BIOL | YES--no info | 40-55,000 | Project Mgr & Asst. Director of Client Services for a Environmental Lab | I feel that the program prepared me very well for the work force and to go on to professional school. |

| | | | | | |
|------|------|--|------------|---|--|
| 2002 | BIOL | NO | 40-55,000 | Cobb County Marietta Water Authority as Water Treatment Operator. Job includes wet chemistry, microbiological testing, treatment process control changes. Familiarity w/different chemicals used to treat drinking water & how they are applied throughout the treatment process. | Limnology, Conservation Mgt., Plant Morphology, Aquatic Biology, Gen Chem, Physics, Microbiology, Biochemistry, & Organic Chem were major helps for this field. Course electives at KSU that were a major help include Georgia Flora & Vegetation & Natural History of Georgia. Virology, Evolution, Epidemiology helps with a knowledge base of pathogenic organisms and viruses that are commonly treated in water & wastewater. An understanding of lakes, rivers and streams has also been a great help. The State of Georgia mandates drinking water operators, wastewater operators, and lab analysts to pass a State certification exam. The college coursework in the "hard" sciences makes the state exams much more bearable, and gives operators and lab analysts an advantage to passing the exams and provides a more endowed career path |
| 2007 | BTEC | Mercer PharmD program starting Aug 07 | no info | no info | no info |
| 2007 | BTEC | Not yet | 25-40,000 | Cytogenetic technologist for private lab in Alpharetta | Prepared me very well. Almost everything I do I learned both from the degree program here at KSU as well as on the job. |
| 2000 | BIOL | Yes, Emory Physician Asst. Program | 85-100,000 | PA Urgent care medicine | KSU provided me with everything I needed. KSU's Genetics education provided me with superior knowledge compared to my fellow graduate students. |
| 2007 | BED | NO | 25-40,000 | Biology Teacher East Paulding High School | Very well. |
| 2007 | BED | Yes, Univ. of W. Ga M.S. in Wildlife Biology | no info | grad student | It prepared me well for graduate studies. |