Proposal for a new Bachelor of Sciences Degree Program: Biomedical Sciences

Oakland University

Department of Biological Sciences, College of Arts and Sciences

Approved by the Department of Biological Sciences
September 7, 2010
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Approved by the CAS Committee on Instruction
November 17, 2010

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SUMMARY

The Department of Biological Sciences in the College of Arts and Sciences proposes a new major: the Bachelor of Science in Biomedical Sciences. In the preparation of this proposal we have consulted with members of the Departments of Philosophy, Psychology, Sociology, Mathematics, Chemistry and Physics, in addition to Faculty of the OUWB-SOM. Demand for education in the areas of biomedical sciences has exploded in recent years, driven both by the needs for physicians and by general workforce trends that are related to health, pharmaceuticals, and medical care. The nature of modern health and medical care requires a good grasp of the basic and clinical sciences, communication skills, social and psychological knowledge, and scientific inquiry, meaning how scientific knowledge is discovered and validated. In addition, medical professionals of the future will require the ability to effectively access, navigate, and mine the vastly expanding information base. Oakland University and in particular the Department of Biological Sciences have already accumulated extensive expertise and experience in general biological and pre-medical education; it has become one of the regional leaders in this field. The establishment of the new OUWB-SOM places the University in an ideal position to offer this specialized program.

The proposed biomedical sciences degree is a "new generation" pre-medical curriculum. The program is a timely necessity that integrates a multitude of disciplines facilitating the individual in developing a broad knowledge base and competency in a number of areas leading to specialized career and graduate education choices. Unlike the major in Biology, which is geared towards gaining a broader foundation of Biological Sciences, the Biomedical Sciences degree requires students to specialize in the biology of human systems. The program is designed to provide excellent preparation for undergraduates students who: (1) plan on continuing education towards a medical professional degree (MD, DO, PA, DVM, etc), or (2) are interested in pursuing an advanced degree (MS, PhD), leading to a research career in human biology.

1. Program Description

a. Introduction

During the past decade, the demand for interdisciplinary and integrative training has expanded greatly in both industry and academia, due in part to the availability of more complex technologies and the application of those technologies in a wide variety of fields. Biomedical science is an example of one such field. Biomedical Science is the application of basic biological information for medical uses, including research, clinical medicine, and health care related monitoring and treatment. Both in the USA and around the world there is a growing demand for trained biomedical professionals who participate in the processes and discoveries that improve human and animal life. These professionals require an understanding of medical and basic biochemistry, pharmacology, anatomy, physiology, microbiology, chemistry, physics, physiology and cellular and molecular biology. Biomedical professionals must also be prepared to be part of a continually changing and dynamic profession and thus must have a firm grounding in both the basic sciences as well as their specialized areas of interest. They must also have good grasp of the integrative underpinnings of these fields, and be capable of accessing expanding bases of information. Excellent communication skills, both oral and written are essential. In addition to acquisition of knowledge, there are expectations of competency in scientific inquiry- including direct experience with the scientific method and its application to medical conditions, data analysis and modeling, and of course the ability for critical thinking, data analysis and computation.

An undergraduate degree in biomedical sciences is very useful for students seeking admission to graduate programs in any of the biomedical sciences. Furthermore, this degree program would prepare students for a wide range of health and medicine related careers. This proposed degree program will produce students who are prepared for professional schools (medical, dental, ophthalmology, pharmacy, physician's assistant etc) as well as those interested in other areas of the biomedical sciences.

The Department of Biological Sciences in the College of Arts and Sciences (CAS) at Oakland University has a long standing tradition of excellence in undergraduate education and research. The department graduates the largest number of majors in the sciences, and these graduates have successfully gone on to pursue graduate and professional studies in medicine, dentistry, veterinary medicine, and employment in biologically related fields. In an effort to maintain our past successes and provide the best preparation for our students, there is a need for more specialized coursework and training that will enable our students to succeed in the changing field of biomedicine. This proposal provides a distinct program combining knowledge based skills and integration that is designed to train students in the rapidly expanding biomedical field, and to address defined competences that are expected in many of today's graduate professional tracks. Faculty members in the department have research interests that span all the traditional biological areas as well as a number newer interdisciplinary areas including Pharmacology, Immunology, Stem Cell research, Cardiovascular Physiology, Cell Communication and Bioengineering.

We believe this to be an outstanding opportunity for Oakland University to begin a cutting-edge interdisciplinary program in a field which will continue to grow at a fast pace. A Biomedical Sciences program will make Oakland University more competitive with other schools in the region and nationally. Additionally, this program provides students with a more focused education for biomedical careers. This program will attract undergraduate students who might otherwise select another institution for their biomedical preparation.

b. Program Goals

The goal of this program is to combine training in biology with additional foundations in the following areas: (1) basic science and math (2) writing and communication (3) medical and clinical studies (4) ethics (5) introductory psychology and sociology, (6) computer data and information management, (7) active learning and critical thinking, and (8) direct scientific research experience.

Students taking this program will benefit if they plan to obtain a medical degree (including MD or DO, dental, ophthalmology, and veterinary degrees), or advanced graduate studies (MS or PhD). Alternatively, the program will provide a strong foundation for additional training towards the following careers: genetic counseling, physician assistant, pharmaceutical and drug development, epidemiology, and others. Additional goals of the proposed program are to attract highly qualified students to the biomedical sciences at Oakland University; improve the course offerings in the biological sciences; increase Oakland's visibility through the addition of this modern integrative program; and stimulate collaborations and funding within Oakland and between the University and local employers in the biomedical area.

2. Rationale for the Program

a. Nature of Work for Individuals Trained in the Biomedical Sciences

Training in the biomedical sciences prepares students for a rapidly expanding range of career choices. In Industry the options include, but are not limited to, product development & testing, microbiology, toxicology, reproductive technologies, pathology technician, and forensic technologist. This degree also prepares students to enter into further training at professional schools such as: physiotherapy, dentistry, veterinary science, osteopathy (DO), medical doctor (MD), chiropractic, biomedical engineering, genetic counseling and graduate schools (MS, PhD). This degree also allows them to pursue other avenues of employment such as: patent law/attorney, science journalism, bioinformatics, health policy development, pharmaceutical sales, biomedical equipment sales, as well as pursuing biomedical research positions in a variety of settings. The proposed program provides a strong foundation for the students to pursue any of these career goals.

b. Program Need and Employment Opportunities

According to the Bureau of Labor Statistics Occupational Outlook Handbook, for all occupations through the year 2014, employment of biological scientists is projected to grow 9 to 17 percent. Furthermore the demand for biomedical scientists in Michigan is predicted to follow this trend through 2016, for example: physicians +11%, physician assistant +20%, pharmacists +16%, and post secondary teachers in the health sciences +17% (www.milmi.org, ref.1).

c. Promotion of the Role and Mission of Oakland University

The Bachelor of Science degree with a major in biomedical sciences is consistent with the overall mission of Oakland University and stated goals of developing a strong concentration in

biomedical sciences. The training for these undergraduate students will come from qualified faculty with a broad research focus. Access to faculty and their research are one of the major strengths for Oakland University's programs. This major can be considered integrative as the biomedical sciences cover a wide range of topics (for example, basic and clinically applied biology, biochemistry, pharmacology, psychology, sociology). The proposed major will also be one of the first to present students with a curriculum which addresses focus areas highlighted in the AAMC-HHMI "Scientific Foundations for Future Physicians" 2009 report (ref. 5). This report describes eight competencies required of students entering Medical School in the 21st century.

Table1 - Correlation of Core Courses with AAMC Competencies

AAMC-HHMI Competency	Core Courses
Quantitative Reasoning	MTH 154, 155 and STA 228
Scientific Inquiry	BIO206, 308, 322, 492, 493, 499, PSY 250
Basic Physical Processes	PHY151, 152
Basic Chemical Principles	CHM 157, 158, 234, 235, 237
Molecular Biochemistry	BIO 111, 325, 473
Molecular Cell Biology	BIO 111, 307, 309
Physiology and Immunology	BIO 207, 322, 423
Genetics and Evolution	BIO 341, 387

The major has been designed to provide students with these competencies and to provide the foundation for the competencies expected of medical students upon completion of their course work (Table 1). This program clearly places Oakland University at the forefront of educating the future medical professionals.

d. Comparison to Similar Programs in Michigan and Nationally

Several academic institutions across the nation offer a bachelor degree in biomedical sciences that is similar to the proposed program. A representative list of these includes:

National University of Health Sciences, Penn State University, Case Western Reserve, Ohio State University, John Hopkin's University, Texas A & M University, Stanford University, Yale University, Barry University. Many universities offer the Biomedical Sciences only as a Master's or PhD level option for students. In Michigan, there are three Biomedical Sciences Undergraduate degree programs, namely:

1. Central Michigan University
(http://www.cmich.edu/Admissions/Academic_Programs/Science_and_Technology/Biology_Biomedical_Sciences.htm**)** (ref.2)

2. Western Michigan University

(http://catalog.wmich.edu/preview_program.php?catoid=11&poid=2080&bc=1) This is the oldest program in the state having started in 1976. The program currently has 509 registered majors. (ref.3)

3. Grand Valley State University

(http://www.gvsu.edu/acad-view.htm?pdfid=044BA67B-9F8F-9637-9DEDB8CCA5960279**)** (ref.4)

However, the proposed program is significantly different from these in that we are requiring students to take ethics, psychology and sociology as part of their coursework (Table 2). The philosophy for our program design is to prepare students not only in the basic sciences but to ensure that they also focus on communication skills, active learning with a broader base in the social sciences. We are specifically addressing these goals by requiring students to take social sciences as part of their required coursework. We are also requiring pharmacology and the capstone course, "Integrative Biomedicine: Team-based Disease Studies" which is unique to Oakland University's program.

Table 2 - Comparison of Biomedical Sciences Programs in Michigan

	UNIVERSITY				
	OU	**GVSU**	**CMU**	**WMU**	**MSU**
Minimum Credits Required	134	120	105	114	120
			Common Requirements		
General Chemistry	Required	Required	Required	Required	Required
Organic Chemistry	Required	Required	Required	Required	Required
Biochemistry	2 Semesters Required	1 Semester Required	1 Semester Required	1 Semester Required	1 Semester Required
Physics	Required	Required	Required	Required	Required
Mathematics	2 Semesters Calculus	Algebra Trigonometry	1 Semester Pre-Calculus	1 Semester Calculus	1 Semester Calculus
Statistics	Required	Required	-	Required	Required
Anatomy	Required	Required	Optional	Required	Required
Physiology	Required	Required	Optional	Required	Required
Microbiology	Required	Required	Optional	Required	Optional
			Program Specific Offerings		
Ethics	Required	-	-	Optional	-
Pharmacology	Required	-	-	Optional	Optional
Psychology	Required	-	-	-	-
Introduction to Research	Required	Required	Required	Optional	-
Evolution	Required	-	Optional	Optional	-
Nutrition	Not Required	Optional	-	-	Optional

Other universities in Michigan, namely Albion, Adrian, Alma, Ferris State, Hope College, Lake Superior State University, Northern Michigan, Eastern Michigan, Wayne State and the University of Michigan, all have biology majors with concentrations or specializations/emphasis on biomedical sciences. Michigan State University has a human biology major which is similar to the proposed biomedical sciences major. Some of the strength of our proposed program

include (i) scope and breadth of required basic sciences, biomedical sciences, and included elements social/psychological curriculum, (ii) rigor, setting the bar high with expectations in the basic sciences, like math, physics, chemistry and biology, (iii) emphasis on familiarity with the process of research/discovery, (iv) integration of biomedical knowledge, (v) active learning and effective communication. The program has been developed to address the pedagogical needs of the expanding field of Biomedicine, some of which have been the focus of the HHMI/AAMC report. Based on the predicted growth of this field the Biomedical Sciences program compares favorably with existing programs at universities in Michigan and fills a specific niche in the undergraduate curriculum.

e. Comparison with Existing Biology BS, BA, and Biochemistry BS

The proposed major in Biomedical Sciences differs from the traditional Biological Sciences major in many respects (Appendix A). The introduction of new courses specifically focused on human biology and disease (Biochemistry of Disease, Human Genetics, Human Microbiology Lab, Principles of Evolutionary Medicine, Pharmacology, Integrative Biomedicine, and Scientific Inquiry Lab) and the more difficult math and physics requirements set this new major apart. In addition, students are also required to take Ethics and psychology courses. These courses are to enhance the students reasoning skills and to provide a foundation for their understanding of the ethical dilemmas encountered in the Medical professions and human behavior. These were areas that the AAMC report suggested were not being adequately addressed in the current pre-medical curricula.

f. Source of Students

The proposed BS in Biomedical Sciences program is expected to be attractive for both existing and new students. Given the extensive academic nature of the program, the potential interest, and our capacity to run it effectively, we anticipate an enrollment of approximately 50 students per year culminating in a steady level of 200 students.

Over the last five years, the number of students majoring in Biology has increased by ~118% (from 367 students in 2005 to 798 students in 2010). This does not take into account undecided "pre-med" students, and students in the biochemistry and engineering biology program, all of which have exhibited similar increases. In total the number of majors in these categories approached 1,000 in the Fall semester of 2010. All indications are that the trend is likely to continue. Of these students, more than half initially expressed an interest in pursuing a professional degree in medicine, dentistry, optometry, veterinary medicine or advanced degrees in the area of biomedical sciences. The dramatic increase in pre-medical students majoring in Biology provides a very suitable background for the development of a more specialized program better suited to fit a sub-set of these students.

The program will undoubtedly attract new students to Oakland University, both because of its uniqueness and because of the special position and reputation of Oakland University in Biomedical education. Equally important, it is anticipated that the program will be an effective "retention factor" of students interested in biomedical sciences that would have otherwise leave Oakland University for other schools. Given the strong interest in biomedical careers, some of the enrollment for in the proposed major in Biomedical Science would likely come from students currently majoring in Biology or related areas. The admission requirements and the academic breadth of the proposed program are expected to limit the number of existing students that enter the program to approximately 30-40 per year from this source.

During Summer sessions I and II and Fall semester of 2010, 480 students (319 declared themselves as Biology majors and 161 indicated Health Sciences, Nursing, Undecided or Other) in our courses (BIO 111, BIO 113, BIO 207, BIO 303, BIO 307, 321,341 and BIO 325) were surveyed. Their responses are shown in the Table 3 below:

Table 3 – Results of Student Surveys

	Yes		No		No opinion	
	Maj.	Non-maj.	Maj.	Non-maj.	Maj.	Non-maj.
Should Oakland offer a degree in Biomedical Sciences?	86%	74%	5%	7%	9%	19%
Would a degree in Biomedical Sciences enhance your career?	69%	50%	20%	33%	11%	17%
If offered, would you consider enrolling in Biomedical Sciences at OU?	63%	47%	24%	39%	13%	14%
If not offered, would consider transferring to another school that offers this program	23%	17%	53%	60%	24%	23%

The results of this survey clearly indicate a strong interest (86% and 74% of current biology majors and non-majors respectively) in a Biomedical Sciences major among Oakland University students. The survey also indicates that a substantial number (63% of biology majors and 47% of non-majors) would consider enrolling in this program if it were offered at Oakland University. Clearly, offering this major will attract students who may not have considered enrolling in Oakland, and failing to cater to this growing interest will lead students to transfer to institutions that do (23% of Oakland University biology majors surveyed would consider transferring to another school in order to major in Biomedical Sciences!).

3. Self Study of the Academic Unit

a. Status of the Unit

The College of Arts and Sciences consists of 16 departments and programs which offers over 60 majors in Bachelor of Arts, Bachelor of Science, Bachelor of Social Work, Bachelor of Music, and Bachelor of Fine Arts degrees. The Department of Biological Sciences currently offers a Bachelor of Arts and a Bachelor of Science in the Biological Sciences with specializations, including microbiology, cell/molecular biology, anatomy, and applied statistics. In conjunction with the Department of Chemistry, it offers the interdisciplinary Biochemistry Bachelor of Science degree and with the School of Engineering and Computer Science, it offers the Bachelor of Science in Engineering Biology.

b. How the Goals of the Unit are Served by the Program

The program is consistent with the goals of the University to serve the needs of Michigan and Oakland County in particular. The program will also enhance the unit's visibility to attract a larger pool of students as well as more research grants and contracts. The program will help grow the enrollments in the unit due to projected job growth in the biomedical sciences.

c. Staffing Needs

Initially, existing faculty can implement the administrative and teaching requirements for the proposed majors. The program will only use existing courses in the first two years. These

courses have been assembled by faculty in biology, chemistry, mathematics, physics, philosophy, psychology and writing.

In the 3rd and 4th year, new courses will be offered to the students (see program details below). Additional faculty will then be required. We included two faculty positions in the second year of the program, and two in the 3rd year. The new hires will be expected to have leading roles in the development and growth of the program. As this happens, additional release time may be required to run the program.

In addition, the program requires one full-time professional pre-medical advising staff position and one half-time secretarial position.

d. Faculty Qualifications

The faculty members of the Biological Sciences Department have the required teaching expertise for the courses proposed in these programs. Additional expertise in the areas of math, chemistry, physics, psychology, sociology, and ethics already exist in the respective departments. Additionally, most of the faculty members in these departments maintain active research program in which the students can participate.

Appendix B lists short biographies of some of the Biological Sciences and other CAS faculty whose research and teaching interests are most closely related to the biomedical sciences program. These faculty members have published journal papers in these areas and either chair or serve on committees for graduate students who are focusing their masters or doctoral studies on fundamental aspects and applications of biomedical sciences.

e. Library Holdings

We requested a library research to define any gaps that may exist between available listings and subscriptions to support the program. We received a detailed analysis, added in appendix C, and a budget necessary to support the acquisitions. The recommended library funds have been incorporated in full to the program's budget.

f. Classroom Space and Equipment

Initially no new classroom space is required, however, in the 3rd and 4th year, new active learning courses will be offered to the students. This will require a dedicated flexible learning space that is significantly reconfigured from the standard OU classroom. The flexible learning space is modeled on that of the College of Biological Sciences at the University of Minnesota (a detailed description is in the following links: www.classroom.umn.edu/projects/alc.html**,** www.classroom.umn.edu/projects/ALC_Report_Final.pdf**,** ref. 6&7). This student-centered classroom must have multiple display screens, a document camera, be equipped with wireless internet access and a minimum of 6 round tables with seating for up to 9 students/table. Each table will be equipped with microphones (one/group of 3 students), laptop outlets, and have a connected large display screen that can be controlled by the individual table or networked with the other display screens to share information. In addition to the standard level audio/visual equipment of OU classrooms, there should be 360 degree white boards. The flexible classroom space will encourage students to share what they know and build on this shared information base. An important part in the productive exchange of knowledge in this room will be the ability of students to freely interact, exchange ideas and work collaboratively with other students and the instructor.

g. Laboratory Space and Equipment

Initially no new laboratory space is required. However, as the program increases in enrollment, there will be a need for additional laboratory space. Because of a dramatic multi-year increase in Biology majors (~104% in 5 years), our current instructional laboratory space is being used at nearly full capacity (48 lab sections in Fall 2010, and 61 lab sections in Winter 2011).

The Biomedical Sciences program requires all students to complete 4 laboratory courses, including the new BIO 308 Human Microbiology lab. Due to the projected interest in this program, we anticipate a need for ~25% more laboratory space, supplies, and equipment. Laboratory equipment must be provided for the new BIO 308 Human Microbiology lab, for BIO 492 Scientific Inquiry, and in order to meet the expanded enrollment in other lab courses. Additionally, shared and general use equipment in support of the laboratory operation (centrifugation, incubator, autoclave, high-end microscopy, etc.) will be needed. Furthermore, although BIO 492 Scientific Inquiry will make use of our newly renovated Lab space in DHE205 due to its requirement for a laboratory with individual networked monitors and internet access, it will need to be equipped with Power Lab hardware and software.

4. Program Plan

a. Degree Requirements Major in Biomedical Sciences

The biomedical sciences program at Oakland University is designed to provide students with the basic knowledge and skills needed to effectively apply scientific and social principles to problems in their specialization areas in the years ahead. A balance between theoretical and practical experience and an emphasis on integrative biology are key elements to the university's biomedical sciences major.

To earn the degree of Bachelor of Science with a major in biomedical science students must complete a minimum of 134 credits, 32 of these credits must be at 300-level or above. The CAS exploratory sequence requirement is fulfilled by CHM157, 158, 234, 235 and 237. In the core there are two courses that synthesize the program and there are program electives that also provide synthesis. They must demonstrate proficiency in writing (see *Undergraduate degree requirements*) and meet the following requirements:

PROGRAM CREDIT STRUCTURE

Core courses		**Credits**
MTH 154-155	Calculus I and II	8
STA 228	Biological Statistics	4
Subtotal		**12**
PHY 151-152, 158	Introductory Physics I, II and lab	10
Subtotal		**10**
CHM 157-158	General Chemistry I and II (includes Lab)	10
CHM 234-235, and 237	Organic Chemistry I, II and Lab	10
Subtotal		**20**
PHL 103	Introduction to Ethics	4
Subtotal		**4**
PSY 100	Foundations of Contemporary Psychology	4
PSY 250	Introduction to Research Design	4
Subtotal		**8**
BIO 111	Biology I	4
BIO 205-206	Human Anatomy and Lab	5
BIO 207	Human Physiology	4
BIO 307-308	Human Microbiology and Lab	5
BIO 309	Biology of the Cell	4
BIO 322	Physiology Lab	1
BIO 325	Biochemistry I	4
BIO 423	Immunology	4
BIO 445	Principles of Evolutionary Medicine	4
BIO 473	Biochemistry of Metabolism and Disease	4
BIO 475	Human Genetics	4
BIO 492	Scientific Inquiry	1
BIO 493	Integrative Pharmacology	3
BIO 499	Integrative Biomedicine and Disease	3
Subtotal		**50**
Core Subtotal		**104**
Program Electives (see below)		**12**
General education[1] (excluding formal reasoning, natural science and technology, social sciences, and western civilization)		**20**
Grand Total		**136**

[1] Students will be encouraged to take the following courses to complete the General Education requirements AN 102 – Culture and Human Nature, SPN 114 – Spanish I, ENG 112 – Literature of Ethnic America, WRT 160 – Composition II, and THA 301 or 302 –Theater History I or II *(also satisfies the writing intensive in Gen-Ed requirement)*

Table 4 - Program Electives

AN	333	Medical Anthropology	4
BIO	301	Ecology	5
BIO	305	Histology	4
BIO	306	Histology lab	1
BIO	317	Vertebrate Zoology	5
BIO	321	Physiology	4
BIO	323	Developmental Biology	4
BIO	324	Developmental lab	1
BIO	326	Biochemistry lab	1
BIO	342	Genetics lab	1
BIO	351	Neurobiology	4
BIO	353	Animal Behavior	4
BIO	355	Neuropharmacology	4
BIO	381	Gross Human Anatomy	4
BIO	401	Advanced Human Physiology	4
BIO	403	Advanced Human Anatomy	4
BIO	407	Cellular Biochemistry	4
BIO	409	Endocrinology	4
BIO	413	Advanced Cell Topics	4
BIO	417	Molecular Biology	4
BIO	419	Advanced Genetics	4
BIO	421	Medical Microbiology	4
BIO	427	Cell Biology of Cancer	4
BIO	437	Virology	4
BIO	443	Functional Genomics	4
BIO	444	Functional Genomics Lab	1
BIO	460	Neuroanatomy	4
BIO	465	Medical Parasitology and Mycology	4
BIO	487	Science of Vision	4
BIO	490	Independent Research	1
PSY	305	Physiological Psychology	4
PSY	330	Social Cognition	4
PSY	338	Health Psychology	4
PSY	341	Abnormal Psychology	4
PSY	343	Psychopathology of Childhood	4
SOC	222	Sociology of Mental Illness	4
SOC	328	Sociology of Health and Medicine	4
SOC	465	Sociological Perspectives on Aging	4
WRT	381	Science Writing	4

b. Course Catalog Descriptions *(new courses)*

BIO 308 Introduction to Human Microbiology Laboratory (1)

Introduction to techniques used for growing, isolating, and handling microbes. A microscopic examination and identification of prokaryotic and eukaryotic organisms including pathogens.

BIO 445: Principles of Evolutionary Medicine (4)

Introduction to the principles of evolutionary biology and their application to understanding human disease and medically relevant topics including the development of antibiotic resistance in pathogenic bacteria and an understanding of how viral evolution impacts vaccine production. Prerequisites: Bio 207 or Bio 321 and Bio 475.

BIO 473: Biochemistry of Metabolism and Disease (4)
Introduction to the metabolic processes and interrelations that exist in healthy and disease state in human systems. This course will cover both metabolic disorders as well as insights to clinical biochemistry related to cancer, myocardial infarction, atherosclerosis and other diseases. Prerequisites: Bio 207 or Bio 321, Bio 325.

BIO 475: Human Genetics (4)
Introduction to classical and molecular inheritance, genetic processes of humans with particular emphasis on human genetic diseases. Topics include gene mapping, genetic diseases, molecular screening,. Prerequisites: Bio 207 or Bio 321.

BIO 492: Scientific Inquiry Laboratory (1)
Integrative laboratory based experience focused on a single medically relevant topic. Exercises will range from basic cell/biochemical to virtual simulations of physiological processes to data mining of available biomedical databases through societal impacts.

BIO 493: Integrative Pharmacology (3)
Introduction to human pharmacology with emphasis on an integrative approach to encompass clinical application, physiological functions, pharmacological principles, biochemistry of actions. Offered fall semester. Prerequisites: Bio 207 or Bio 321, and Bio 325.

BIO 499: Integrative Biomedicine and Disease (3; capstone course)
Investigation of clinically relevant diseases using an integration of biological sub-disciplines. Students will use technical reports, journal articles, and articles in the popular press, historical records, and internet resources to investigate treatment of pathological conditions, cultural effects of diseases, historical impacts and ethics of managing different diseases. Oral and written communication and critical thinking skills will be emphasized. Offered winter semester. Prerequisites: Bio 493 and senior standing. *Satisfies the university requirement for a writing intensive course in the major. Satisfies the university general education requirement for the capstone experience.*

c. Admission Criteria

Students will be admitted to the program upon completing BIO 111 and CHM 157 with a grade of point average (GPA) of 3.6 and declaring the major. Students in any of the Biology tracks are natural candidates for the program after completion of their Freshman year. Yet, the goal of the program is specifically to broaden participation in the biomedical sciences and by also reaching out to other students from within Oakland as well as other institutions. In addition to the previously stated requirements, satisfactory completion of the program requires a minimum grade point average of 3.0 in the courses taken to satisfy the core courses in biology, chemistry, mathematics, psychology, philosophy, and physics.

d. Administrative Personnel/Procedures Needed to Support Program
Two staff positions will be required to assist with the program: a full-time professional advisor and an initially part time transitioning to full time clerical staff person. The advisor will focus on helping students with their academic choices and placement, evaluation of student progress, and will assume a large portion of the pre-medical advising, which has become a major undertaking in recent years. We included a part-time clerical position on the initial years, to expand to a full

time clerical at the 4th, in much-needed support of all department office activities needed to accommodate the increase in enrollments, class sections, laboratories, and overall traffic that is associated with running an additional medium- to large-size program in the department. No special procedure or mechanism will be necessary to run the program, as compared with the ongoing departmental ones.

e. Sample 4-year Schedule

Table 4

BIOMEDICAL SCIENCE SAMPLE SCHEDULE

Freshman	**Cr.**	**Sophomore**	**Cr.**	**Junior**	**Cr.**	**Senior**	**Cr.**
Fall Semester		**Fall semester**		**Fall semester**		**Fall semester**	
BIO 111	4	BIO 207	4	BIO309	4	BIO 493	3
CHM 157	5	BIO 206	1	BIO 325	4	Program Elective	4
MTH 154	4	CHM 234	4	BIO 445	4	CHM 237	2
WRT 160	4	PHY 151	4	PHY 158	2	STA 228	4
		PHL 103	4	PSY 250	4	AN102	4
Subtotal	**17**	**Subtotal**	**17**	**Subtotal**	**18**	**Subtotal**	**17**
Winter semester	**Cr.**	**Winter semester**	**Cr.**	**Winter semester**		**Winter semester**	**Cr.**
BIO 205	4	BIO 475	4	BIO 307	4	BIO 499	3
CHM 158	5	BIO 322	1	BIO 308	1	BIO 492	1
MTH 155	4	CHM 235	4	BIO 423	4	Program Elective	4
SPN 114	4	PHY 152	4	BIO 473	4	Program Elective	4
		PSY 100	4	ENG 112	4	THA 301 or 302	4
Subtotal	**17**	**Subtotal**	**17**	**Subtotal**	**17**	**Subtotal**	**16**
						Grand total	**136**

f. New Course Syllabi

See appendix D

g. Support and Consent from Other Academic Units

Letters of support are attached in appendix E

h. Student Recruiting, Retention, Monitoring and Advising

One of the key missions of this program is the opportunity to attract new, highly qualified students to Oakland University. Therefore, we will devote valuable resources to the recruitment, advising and mentoring of these students to ensure that they are properly advised and retained in the program. We see the need for proper advertising of the program and the need for outreach efforts to make is visible as the main rationale for requesting additional dedicated faculty positions and support personnel.

In addition, because this program is highly structured, it will be very advantageous to develop a "Biomedical Sciences Connections" for first year students. This will enable students to begin to form a cohort of active learners and to increase their retention at OU.

5. Revenue/Costs

a. Budget structure

		Budget Year 1	Budget Year 2	Budget Year 3	Budget Year 4	Budget Year 5
Revenue Variables:						
Headcount (new students)		**50**	**100**	**150**	**200**	**200**
Average credits per year per major		**30**	**30**	**30**	**30**	**30**
Total Credit Hours		**1500**	**3000**	**4500**	**6000**	**6000**
Undergraduate (lower)		1125	1950	2475	3000	3000
Undergraduate (upper)		375	1050	2025	3000	3000
Total FYES		**15.63**	**100.00**	**150.00**	**200.00**	**200.00**
Undergraduate (cr.÷30)		15.63	100.00	150.00	200.00	200.00
Tuition Rate Per Credit Hour						
Undergraduate (lower)		$ 309.50	$ 309.50	$ 309.50	$ 309.50	$ 309.50
Undergraduate (upper)		$ 338.25	$ 338.25	$ 338.25	$ 338.25	$ 338.25
Graduate		$ 540.50	$ 540.50	$ 540.50	$ 540.50	$ 540.50
Revenue						
Tuition		$ 475,031	$ 958,688	$ 1,450,969	$ 1,943,250	$ 1,943,250
Total Revenue		$ 475,031	$ 958,688	$ 1,450,969	$ 1,943,250	$ 1,943,250
Compensation						
Salaries/Wages						
Faculty Inload Replacements	6301	$ 30,000	$ 60,000	$ 90,000	$ 120,000	$ 120,000
Faculty Salaries	6101	$ -	$ 150,000	$ 300,000	$ 300,000	$ 300,000
Faculty Overload	6301	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 7,500
Part-time Faculty	6301	$ -	$ -	$ -	$ -	$ -
Visiting Faculty	6101	$ -	$ -	$ -	$ -	$ -
Administrative	6201	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 45,000
Administrative - IC	6221	$ -	$ -	$ -	$ -	$ -
Clerical	6211	$ 9,500	$ 12,667	$ 19,000	$ 38,000	$ 38,000
Student	6501	$ -	$ -	$ -	$ -	$ -
Graduate Assistantship Stipend	6311	$ 21,000	$ 42,000	$ 63,000	$ 84,000	$ 84,000
Out of Classification	6401	$ -	$ -	$ -	$ -	$ -
Overtime	6401	$ -	$ -	$ -	$ -	$ -
Total Salaries/Wages		$ 113,000	$ 317,167	$ 524,500	$ 594,500	$ 594,500
Fringe Benefits	6701	$ 30,261	$ 101,417	$ 174,281	$ 186,922	$ 186,922
Total Compensation		**$ 143,261**	**$ 418,584**	**$ 698,781**	**$ 781,422**	**$ 781,422**
Operating Expenses						
Supplies and Services	7101	$ 15,000	$ 25,000	$ 35,000	$ 45,000	$ 55,000
Graduate Assistant Tuition	7726	$ 21,620	$ 43,240	$ 64,860	$ 86,480	$ 86,480
Travel	7201	$ 2,000	$ 4,000	$ 6,000	$ 8,000	$ 10,000
Telephone	7301	$ -	$ -	$ -	$ -	$ -
Equipment	7501	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000
Library	7401	$ 18,778	$ 22,380	$ 24,108	$ 25,971	$ 27,978
Lab Startup	7101		$ 120,000	$ 240,000	$ 240,000	$ 120,000
One Time Investment/Program Startup Cost		$ -	$ 200,000	$ -	$ -	$ -
Advertising		$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000
Total Operating Expenses		**$ 75,398**	**$ 432,620**	**$ 387,968**	**$ 423,451**	**$ 317,458**
Total Expenses		$ 218,659	$ 851,204	$ 1,086,749	$ 1,204,873	$ 1,098,880
Net		$ 256,373	$ 107,484	$ 364,220	$ 738,377	$ 844,370

b. Budget Narrative and 5 Year Implementation

The proposed program will be highly attractive to students interested in a strong, in-depth preparation in the biomedicine, and is expected to bring a substantial number of new students to campus. The budget conservatively projects 50 new students per year in the first 4 years to reach a steady level of 200 students. Figures of new students are in addition to a number of existing students shifting into the new program in its first 2-3 years of existence. Based on the Oakland University's, Michigan State, and national trends of increased interest in Biological and Biomedical Sciences with the documented steady increase in our biology major count (15%/year in the past several years), we expect the new program in Biomedical Sciences and existing programs in Biology to increase in parallel for at least 5-10 years into the future.

I. Revenues

Following the conservative head-count of new students detailed in the budget outline, revenue from tuition will be substantial: from $475,000 in the first year to $1.9 million in years four and five. These figures are in reasonable proportion to the current tuition revenue of our Biology UG programs (approx. 800 majors, total annual estimated revenue of over $7.7 million).

II. Additional instruction needed to support the program:

The precise number of sections depends on the limits on each class size as well as availability of sections and may be somewhat hard to project in absolute terms. We have used our 4-year sample schedule as a template to estimate the number of additional lab and class sections the program will require (see Table 6). We estimate from year 4 and on, up to an additional 27 new class and 15 lab sections per year will be needed to support the growing program enrollment.

Table 6

CLASS SECTION NEEDS BASED ON THE PROGRAM'S SAMPLE SCHEDULE							
Freshman	**Add'nl sections needed**	**Sophom.**	**Add'nl sections needed**	**Junior**	**Add'nl sections needed**	**Senior**	**Add'nl sections needed**
Est. # students	**50**	**Est. # students**	**50**	**Est. # students**	**50**	**Est. # students**	**50**
Fall		**Fall**		**Fall**		**Fall**	
BIO 111	0.5	BIO 207	0.5	BIO 309	1	BIO 493*	1*
CHM 157	0.5	BIO 206	3	BIO 325	1	Elective	1
MTH 154	0.5	CHM 234	0.5	BIO 445	1	CHM 237	3
WRT 160	2	PHY 151	0.5	PSY 250	0.5	STA 228	1
		PHL 103	0.5			AN102	0.5
Winter		**Winter**		**Winter**		**Winter**	
BIO 205	0.5	BIO 475*	1*	BIO 307	1	BIO 499*	2*
CHM 158	0.5	BIO 322	3	BIO 308*	3, 1*	BIO 492*	3, 1*
MTH 155	0.5	CHM 235	0.5	BIO 423	1	Elective	1
SPN 114	2	PHY 152	0.5	BIO 473*	1*	Elective	1
		PSY 100	0.5	ENG 112	1	THA 301/302	0.5
Totals							
Year 1 Total	**7.0 Class 0.0 Lab**	Year 2 Total	**4.5 Class 6.0 Lab**	Year 3 Total	**7.5 Class 3.0 Lab**	Year 4 Total	**8.0 Class 6.0 Lab**
		Accumulating Year 2	**11.5 Class 6.0 Lab**	Accumulating Year 3	**19.0 Class 9.0 Lab**	Accumulating Year 4	**27.0 Class 15.0 Lab**

Lab sections will be taught by graduate students that are hired as Graduate Assistants (GA). Each GA teaches 2 lab course sections a year. Class sections may be covered in part by in-load replacement by paid instructors (at $1,500 per class credit), or by full-time faculty where expertise at a faculty level is required. Both have been added as line items in the budget.

III. Additional Faculty lines:

Several critical classes requiring faculty expertise that are currently not available in the department are indicated with an asterisk in Table 6. By year 4, we project a need for four new full-time faculty (will cover 8-10 class sections). Tenure-track faculty in Biological Sciences are required to develop extramurally funded research programs and for that they are given laboratory space and start-up funds. We have distributed the hiring to 2 in the second year and two in the third year. The faculty that will be hired will help cover the following teaching assignments, as summarized in Table 7 below:

Table 7 - New Faculty Hiring and their Specific Teaching Loads

Courses covered	Year 1	Year 2	Year 3	Year 4
Bio 475, 445		Genetics	Genetics	Genetics
Bio 325, 473		Biochemistry	Biochemistry	Biochemistry
Bio 493, 499			Pharmacology	Pharmacology
Bio 492, 499			Physiology	Physiology
Accumulating total	0	2	4	4

IV. Graduate Assistants:

Graduate students are needed in instruction support of laboratory course sections. We increase the group of students from one PhD level and one MS level in year one, to four + four in year 4 and later. This will be sufficient to cover 16 annual lab sections. Graduate Assistants receive stipend and tuition. The dollar amount is different for the MS and PhD levels.

V. Administrative Staff:

We included in the budget two staff positions: a full-time professional advisor and a part time becoming full time clerical. The advisor will focus on helping students with their academic choices and placement, evaluation of student progress, and will assume a large portion of the pre-medical advising. The latter, premedical advising, is a crucial and time-consuming responsibility that for many years relied on a single faculty member in the Biology department. With our pre-medical student body expanding so much, and projected to continue expanding this capacity must be shared and completes the requested advisor's responsibilities to justify a new, full-time administrative position. We included a part-time clerical position on the initial years, to expand to a full time clerical at the 4th year, in necessary support of all department office activities needed to accommodate the increase in enrollments, class sections, laboratories, and overall traffic that is associated with running an additional medium- to large-size program in the department.

VI. Supplies and Services:
Built into the budget is a line item for supplies and services. This includes expenses for operation the teaching labs as well as additional costs of operating the department's offices.

VII. Equipment:
A line item for equipment was added, to fund update and replacement of teaching lab equipment.

VIII. Advertising:
Funds at a level of $3,000 a year are requested to produce flyers and brochure for distribution.

6. Program Assessment

University Mission Goals: Quotations from the Oakland University Mission Statement

A. Instruction

To offer …."instructional programs of high quality that lead to degrees at the... bachelors level"…. and to …." prepare students for post-baccaleaurate education, professional schools, or careers directly after graduation". Apart from the factual and conceptual content of our courses, our instructional program is intended to foster the integration cognitive learning with the personal growth of the individual student in the emotional, social, physical, cultural, ethical and interpersonal domains.

B. Research and Scholarship

"The university's research and scholarship mission is …" to advance knowledge through the research and scholarship of its faculty and students". "Wherever possible, students are involved in research projects, and the results of research and scholarship are integrated into related courses of instruction".

Relevant Goals of the Biomedical Sciences Program

A. Instruction

Our main goal is to assure that students will know and understand the major concepts in the discipline including molecular, cellular, organismal, physiological and evolutionary biology. Additionally, a successful instructional program should lead to successful careers in professions that require a foundation in biomedical sciences.

B. Research and Scholarship

Research and scholarship are the cornerstones of the department. Biomedical Sciences students should acquire knowledge of science as a process and an appreciation of how modern biological research is conducted and communicated.

Student Learning Outcomes

Based on program goals,

- Students will demonstrate a substantial knowledge base and a grasp of the major concepts in biology. Students will demonstrate sufficient knowledge and competence in writing and communication for success on standardized exams or employment.
- Students will perform satisfactorily in standardized graduate examinations.
- Students will know how to research a topic using standard electronic methods,
- Students will know how science is communicated by oral and written means

- Students will be cognizant of the prevailing ethical issues in the biomedical sciences.
- Students will appreciate the role of research in the biological sciences
- Motivated students will participate in design of experiments, collection and analysis of data and communication of their findings.

Methods of Assessment

A. Instruction Direct measures

We will compile scores on standardized national tests (MCAT and DAT) that can be compared to past OU student performance as well as compared to national norms as reported by the respective testing agency. In addition, we'll examine data on the proportion of professional school (Dental, Medical, Veterinary) admits during the assessment period. Since students who complete the GRE are not required to have the results sent to their home institution, we are no longer able to get a significant sample from this source however these scores may be used on an anecdotal basis.

Indirect Measures

Indirect measures of student learning will include an Exit Survey that will be administered to students in their capstone course (BIO 499). This course will have two sections each Fall and Winter semester hence ample data will be gathered each year. A copy of this survey is appended (page 4). The function of the exit survey is to determine student perceptions of the program's strengths and weaknesses and to solicit ideas of what might improve the curriculum from a student's perspective.

We will also administer a two-page Alumni Survey every five years (see below). The purpose of this survey is to discover how various aspects of our program is viewed by our former students in the context of their professional lives after graduating. It focuses on their perceptions of our program quality and the usefulness of specific components of their biomedical sciences major/curriculum to their career thus far.

The Assessment Committee will also examine course-by-course assessment data once each year from our general education courses and our core courses by interacting with faculty who use embedded questions on exams as a means to evaluate student knowledge across years.

Research and Scholarship: direct measures

We will use our capstone course (BIO 499, 3cr.,) as a direct measure of research and scholarship by using one of the writing assignments as an embedded instrument for assessment. One of the written assignments that is required for this course will be selected as the embedded writing assignment. A sample of 15% of these papers will be evaluated by multiple raters on a two-year cycle following the grading rubric (see below).

Research and Scholarship: indirect measures

The number of publications, of all types, peer reviewed and non-peer reviewed, that include undergraduate student co-authors may also be used as an anecdotal measure. In part, the Alumni Survey will provide feedback on the success of the program in preparing students for biology-related careers or graduate programs.

Individuals Responsible for Assessment Activities

A Departmental Assessment committee will appointed by the department chair to gather assessment data. This committee will have the responsibility of processing the data and preparing the report.

Procedures for using Assessment Results to Improve Program

The Assessment Committee Chair will discuss assessment results with the Departmental Curriculum Committee after they have been compiled. The results of these assessment tools and specific concerns will be conveyed to the department in a faculty meeting for discussion about what response, if any, is appropriate. The Assessment Committee will also monitor course-by-course assessment data from embedded question results and report summary results of this analysis to the department for discussion.

Exit Survey for Biomedical Sciences BS Graduates

Please take a moment to consider the courses and instructors in Biomedical Sciences program that you have experienced during your time here at Oakland. Then answer the following questions and return this form in the envelope provided. The envelopes will not be opened until all grades have been submitted for courses in the current term. Responses will be confidential and anonymous.

What do you believe to be the main **strengths** of the Biomedical Sciences program in terms of what it has done to help you develop as a science student?

What do you believe to be the main **weaknesses** of the Biomedical Sciences program?

What changes would you suggest that could improve this program?

What are your plans after graduation?

Do you feel confident that your biomedical coursework and independent study (if any) have prepared you for the next step of your career progression? Please indicate if you did independent research (BIO 490) while at O.U.

Evaluation Rubric BIO 499 (Capstone) Written Assignment

Name of student: _____ Year of graduation: _____

Date of evaluation: _____

Evaluation Summary:

Major Problems/Concerns:

EVALUATION RUBRIC Category	Score
Abstract: suitable and complete summary of what was done, the nature of the research, the major findings, conclusions, style	3 2 1 0
Introduction: background literature, hypothesis, goals or question that was examined, grammar, style	3 2 1 0
Materials and Methods: protocols, reagents, organisms, nomenclature, grammar, style	3 2 1 0
Results: experimental design, data presentation (including figures and tables with captions) and accuracy, text explanations of table & figure content, grammar	3 2 1 0
Discussion: Are the findings above put in context with what is known from the literature? Is there evidence of critical thinking, insight into the subject, understanding of the work done, qualifications/weaknesses, and the relevant literature?	3 2 1 0
Conclusions: summary of results, literature support of results, how they do/do not support the hypothesis or achieve goals, future directions,	3 2 1 0
References: correct format, completeness and relevance	3 2 1 0
Other components: grammar, style	3 2 1 0

Scores
3: exceeds requirements for competence and completeness
2: competent and complete in nearly all respects
1: some components of the category are insufficient or lacking
0: inadequate in terms of competence and/or clarity/completeness

7. References

1. Michigan labor market information. **www.milmi.org**

2. Description of the Biomedical Sciences Program at Central Michigan University **www.cmich.edu/Admissions/Academic_Programs/Science_and_Technology/Biology_Biomedical_Sciences.htm**

3. Description of the Biomedical Sciences Program at Western Michigan University. **http://catalog.wmich.edu/preview_program.php?catoid=11&poid=2080&bc=1**

4. Description of the Biomedical Sciences Program at Grand Valley State University. **http://www.gvsu.edu/acad-view.htm?pdfid=044BA67B-9F8F-9637-9DEDB8CCA5960279**

5. Scientific Foundations for Future Physicians (2009) Report of the AAMC-HHMI committee.

6. University of Minnesota description of active learning classrooms **www.classroom.umn.edu/projects/alc.html**

7. University of Minnesota Report on active learning classrooms. **www.classroom.umn.edu/projects/ALC_Report_Final.pdf**

8. Appendices

Appendix A

Program Requirements	**Biomedical Sciences BS**	**Biology BS**	**Biology BA**
Biology Core Courses	1 semester Intro Biology	2 semesters Intro Biology	2 semesters Intro Biology
	Biochemistry I and Biochemistry of Disease*****	Biochemistry I and Biochemistry II	Fundamentals of Biochemistry
	Human Genetics*****	Genetics	Genetics
	Principles of Evolutionary Medicine*****	Evolutionary Biology	Evolutionary Biology
	Biomedical Core (all of following required): Human Anatomy Human Physiology Human Microbiology Cell Biology Immunology Integrative Pharmacology*****	*Cell/Molecular Core (1 of following required):* Cell Biology, General Microbiology, Physiology, Developmental Biology, Molecular Biology	*Cell/Molecular Core (1 of following required):* Cell Biology, General Microbiology, Physiology, Developmental Biology, Molecular Biology
	(No System Biology Core Requirement)	*System Biology Core (1 of following required):* Ecology, Field Biology, Botany, Vertebrate Zoology, Animal Behavior, Field Botany	*System Biology Core (1 of following required):* Ecology, Field Biology, Botany, Vertebrate Zoology, Animal Behavior, Field Botany
Laboratory Requirement	Human Anatomy Lab Human Microbiology Lab* Human Physiology Lab Scientific Inquiry Lab*****	Intro Bio Lab 4 Labs above 1XX	Intro Bio Lab 3 Labs above 1XX
Program Electives	3 Electives - Biology, selected upper level Psychology, Sociology, and Writing	3 Electives- Biology (*1 must be 4XX*)	2 Elective – Biology (*1 must be 4XX*)
Capstone	Integrative Biomedicine*****	Scientific Inquiry and Communication	Scientific Inquiry and Communication
Co-requirements			
Chemistry	2 semesters General Chemistry 2 semesters Organic Chemistry and Lab	2 semesters General Chemistry 2 semesters Organic Chemistry and Lab	2 semesters General Chemistry 1 semester Organic Chemistry
Physics	2 semesters Calculus Based Physics	2 semesters Physics and Lab	2 semesters Physics and Lab
Mathematics	2 semesters Calculus and Biostatistics	Precalculus, 1 semester Calculus and Biostatistics	Precalculus and Biostatistics
Philosophy	Introduction to Ethics		
Psychology	Foundations in Contemp. Psychology Introduction to Research Design		

* New course for BMS program

Appendix A

Program Requirements	**Biomedical Sciences BS**	**Biochemistry BS**
Biology Core Courses	**43 credits**	**16 credits** from the following courses: Intro Biology I, Intro Biology II, Cell Biology, Cell Biology Lab, Microbiology, Microbiology Lab, Physiology, Physiology Lab, Developmental Biology, Developmental Biology Lab
	1 semester Intro Biology I	
	Biochemistry I and Biochemistry of Disease*****	
	Human Genetics*****	
	Principles of Evolutionary Medicine*****	
	Biomedical Core (all of following required): Human Anatomy Human Physiology Human Microbiology Cell Biology Immunology Integrative Pharmacology*****	
Biology Laboratory Requirement	**4 credits** Human Anatomy Lab Human Microbiology Lab* Human Physiology Lab Scientific Inquiry Lab*****	none
Chemistry	**20 credits** 2 semesters General Chemistry 2 semesters Organic Chemistry and Lab	**39 credits** 2 semesters General Chemistry 2 semesters Organic Chemistry and Lab 2 semesters Physical Chemistry 1 semester Analytical Chemistry 2 semesters Biochemistry (BCM 453/454)
Capstone	**3 credits** Integrative Biomedicine*****	**2 credits** Biochemistry Laboratory (BCM 457)
Co-requirements		
Physics	2 semesters Calculus Based Physics and Lab	2 semesters Calculus Based Physics
Mathematics	2 semesters Calculus and Biostatistics	2 semesters Calculus (Statistics recommended)
Philosophy	Introduction to Ethics	none
Psychology	Foundations in Contemp. Psychology Introduction to Research Design	none

Appendix B

Faculty Credentials

This short synopsis highlights some of the most relevant activities of the Department of Biological Sciences faculty whose research and teaching interests are closely related to the Biomedical Sciences program.

Banes-Berceli, Amy, Assistant Professor, Biological Sciences

Research Interests: Renal and vascular effects of hypertension and diabetes.

- Research published in journals Hypertension, JASN, AJP-renal, AJP-regulatory
- Research related to Biomedical Sciences

Teaching Interests:

- Clinical Anatomy and Physiology, BIO121
- Human Physiology, BIO207, BIO321, BIO401
- Pharmacology, BIO493 (*future*)

Berven, Keith, Associate Professor, Biological Sciences

Research: Population dynamics and larval ecology of wood frogs.

- Research published in journals: Copeia, Ecology, Evolution
- Research related to Systems Biology

Teaching Interests:

- Life on Earth, BIO110
- Field Biology, BIO303
- Vertebrate Zoology, BIO317
- Population Biology and Community Ecology, BIO483/583

Chaudhry, G. Rasul, Professor, Biological Sciences

Research: Gene Expression, Genetic Engineering, Environmental Biotechnology.

- Research published in journals: Stem Cells and Development, Tissue Engineering, Journal of Biomedical Materials Research, Journal of Neurosurgery-Spine
- Research related to Biomedical Sciences

Teaching Interests:

- General Microbiology, BIO319
- Virology, BIO437
- Molecular Biology, BIO440
- Advanced Topics in Genetics, BIO517

Dvir, Arik, Associate Profssor, Biological Sciences

Research: Biochemistry and Enxy mology of Eukary otic Gene Transcription.

- Research published in journals: Proceedings of the National Academy of Sciences, Journal of Biological Chemistry, Methods in Enzymology, Biochimica et Biophysical Acta
- Research related to Biochemistry/Biomedical Sciences

Teaching Interests:

- Biochemistry I, BIO325
- Biochemistry Laboratory, BIO326
- Biochemistry II, BIO425

Gamboa, George, Professor, Biological Sciences

Research: Kin recognition; behavioral ecology of primitively eusocial insects.

- Research published in journals: Animal Behaviour, Ethology.
- Research related to Systems Biology

Teaching Interests:

- Life on Earth, BIO110
- Biology Laboratory, BIO116
- Animal Behavior, BIO353
- Topics in Behavioral Biology, BIO484/584

Gordon, Sheldon, Professor, Biological Sciences
Research: Regulation of cell migration along natural extracellular matrices during wound repair; cytoskeletal function and cell-matrix interactions during mitosis and cell movement.

- Research published in journals: Journal of Tissue Viability, Cell Tissue Research, Cell Motility and the Cytoskeleton, Experimental Cell Research
- Research related to Cell Biology/Biomedical Sciences

Teaching Interests:

- Life on Earth, BIO110
- Field Biology, BIO303
- Vertebrate Zoology, BIO317
- Population Biology and Community Ecology, BIO483/583

Govind, Chhabi, Assistant Professor, Biological Sciences
Research: Regulation of chromatin structure and gene expression in mammalian and yeast cells.

- Research published in journals: Molecular Cell, Genes & Development, Molecular & Cellular Biology, and Proceedings of the National Academy of Sciences (USA).
- Research related to Gene Regulation/Cell Biology/Biomedical Sciences

Teaching Interests:

- Biochemistry I, BIO 325
- Biochemistry I Lab, BIO 326
- Biochemistry II, Bio 425

Grudzien, Thaddeus, Associate Professor, Biological Sciences
Research: Evolutionary Genetics of Island Populations, Biochemical Systematics of Ranid Frogs.

- Research published in journals: Journal of Herpetology, Animal Behavior, Journal of Chemical Ecology
- Research related to Systems Biology/Evolutionary Genetics

Teaching Interests:

- Introductory Biology for Science Majors, BIO111, 113
- Dendrology, BIO327
- Evolutionary Biology, BIO387
- Topics in Evolutionary Biology, BIO482/582

Hansen, Fay M., Associate Professor, Biological Sciences
Research: Mechanisms of angiogenesis.

- Research published in journals: Angiogenesis, American Journal of Physiology -Heart and Circulatory Physiology, Clinical Experimental Pharmacology and Physiology
- Research related to Biomedical Sciences

Teaching Interests:

- Human Biology, BIO104
- Human Anatomy, BIO205
- Histology, Lab, BIO305/306
- Developmental Biology, Lab, 323/324

Hitt, Anne L., Associate Professor, Biological Sciences
Research Interests: Cytoskeleton-Membrane Interactions; Membrane Protein Structure and Function.

- Research published in journals Cell Motility and the Cytoskeleton, Analytical Biochemistry, Biochemica et Biophysica Acta, Journal of Cell Biology, Journal of Biochemistry
- Research related to Biomedical Sciences

Teaching Interests:

- Introductory Biology for Science Majors, BIO111
- Cell Biology, BIO309
- Biochemistry, BIO325
- Biological Communications II, BIO672

Jiang, Lan, Assistant Professor, Biological Sciences
Research: Mechanisms of biological tube formation in Drosophila tracheal system.

- Research published in journals: Developmental Biology, Journal of Biological Chemistry, Molecular Cellular Biology
- Research related to Developmental Biology/Biomedical Sciences

Teaching Interests:

- Genetics, BIO341
- Biological Communications II, BIO672

Lal, Shailesh K. Associate Professor, Biological Sciences
Research: Mechanism and regulation of pre-mRNA processing in plants**.**

- Research published in journals: DNA Sequence, Heredity, Proceedings of the National Academy of Science, Bichimica et Biophysica Acta, Plant Molecular Biology.
- Research related to Bioinformatics

Teaching Interests:

- Introductory Biology for science majors, BIO111
- Human Microbiology, BIO307
- Botany, BIO311
- Bioinformatics, Lab, BIO443/444
- Introduction to Engineering Biology, EGB390

Lindemann, Charles B. Professor, Biological Sciences
Research: Physiology and biophysics of mammalian sperm motility, causal factors involved in the maintenance of and cessation of sperm motility.

- Research published in journals: Journal of Cell Science, Cell Motility and the Cytoskeleton, Biophysical Journal, Proceedings of the National Academy of Science.
- Research related to Biophysics/Biomedical Sciences

Teaching Interests:

- Human Physiology, BIO207
- Advanced Human Physiology, BIO401

Liu, Zijuan, Assistant Professor, Biological Sciences

- **Research Interests**: Metalloid toxicology and detoxification pathways. Metalloid arsenic/selenium transport in prokaryotes and eukaryotic zebrafish and mammals.
- Research published in journals: Proceeedings of the National Academy of Science, Journal of Biological Chemistry, Environmental Health Perspectives, Biometals.
- Research related to Biomedical Sciences:

Teaching Interests:

- General Microbiology and Lab, BIO319/320
- Biochemistry I, BIO325

Madlambayan, Gerard, Assistant Professor, Biological Sciences

Research Interests: Role of stem cells in cancer.

- Research published in journals: Blood, Leukemia, Bone Marrow Transplant, Experimental Hematology.
- Research related to Biomedical Sciences:

Teaching Interests:

- Advanced Topics in Cell Physiology, BIO513
- Introduction to Engineering Biology, EGB390

Moudgil, Virinder K, Professor, Biological Sciences

Research Interests: Mechanism of action of steroid hormones; biology of aging, hormones and cancer.

- Research published in journals: Hormone Molecular Biology and Clinical Investigation, Nanomedicine: Nanotechnology, Biology and Medicine, Metabolic Syndrome and Related Disorders, Oncogene.
- Research related to Biomedical Sciences:

Teaching Interests:

- Cellular Biochemistry, BIO407
- Endocrinology, BIO409
- Advanced Topics in Cell Physiology, BIO513

Shastry, Barkur S., Associate Professor, Biological Sciences

Research Interests: Molecular genetics of inherited eye disorders.

- Research published in journals: Molecular Medicine Reports, Molecular Vision, Graefes Archive for Clinical and Experimental Ophthalmology.
- Research related to Genetics/Biomedical Sciences:

Teaching Interests:

- Human Biology, BIO104
- Genetics, BIO341

Suvas, Susmit, Assistant Professor, Biological Sciences

Research Interests: Immunobiology of chronic inflammation induced in response to viral infections and advancing age.

- Research published in journals: Journal of Immunology
- Research related to Genetics/Biomedical Sciences:

Teaching Interests:

- Human Biology, BIO104
- Genetics, BIO341

Tiegs, Scott, Assistant Professor, Biological Sciences
Research Interests: Stream and river ecology, Human impact to riverine ecosystems, role of species in the ecosystem**.**

- Research published in journals: Ecosystems, American Midland Naturalist. Canadian Journal of Fisheries and Aquatic Sciences, Freshwater Biology, Biological Invasions
- Research related to Ecology/Systems Biology:

Teaching Interests:

- Introductory Biology for Science Majors, BIO113
- Ecology, BIO302
- Ecology of Streams and Rivers, BIO471/571

Walia, Satish, Associate Professor, Biological Sciences
Research Interests: Molecular microbiology; ecology, epidemiology and mechanism of bacterial antibiotic resistance and virulence genes.
Research published in journals: Pesticide Biochemistry and Physiology, FEMS Microbiology Letters, Journal of Environmental Science and Health

- Research related to Microbiology/ Ecology/Biomedical Sciences

Teaching Interests:

- Microbiology, BIO307, BIO 319
- Medical Microbiology, BIO421/521
- Microbial Biotechnology, BIO441/541

Wendell, Douglas, Associate Professor, Biological Sciences
Research Interests: Mechanisms of growth control; genetics of complex traits; genetic mapping and molecular cloning of tumor growth genes.
Research published in journals: BCM Genetics, Journal of Steroid Biochemistry and Metabolism, Mammalian Genome, Carcinogenesis

- Research related to Genetics/Biomedical Sciences:

Teaching Interests:

- Introductory Biology for Science Majors, BIO111
- Genetics and Lab, BIO 341/342
- Advanced Genetics, BIO419/519

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MEMORANDUM

To: Arik Dvir, Chair, Dept. of Biological Sciences, CAS

From: Shawn V. Lombardo, Collection Development Coordinator

Date: October 15, 2010

Re: Library collection evaluation for proposed BS in Biomedical Sciences

In developing this collection evaluation, we reviewed the draft proposal for a BS in Biomedical Sciences, lists of core journals in the field, and the library holdings of other institutions granting degrees in the discipline (including the Grand Valley State University, Western Michigan University and Central Michigan University). In addition, the director of the Oakland University William Beaumont School of Medicine (OUWBSM) Library was consulted to determine what future resources the medical library will be acquiring to support the School of Medicine. Although Kresge Library has a number of important biomedical resources, nevertheless there are some important materials that should be acquired to support the proposed program adequately. Below is a brief description of the resources currently available, those that should be acquired, and a five-year cost estimate for additional library resources.

Journals

To evaluate the library's biomedical journal collection, Kresge Library's current holdings were compared to the 2008 *ISI Journal Citation Report* (*JCR*) of top-ranked journals in the areas of biochemistry and molecular biology, physiology, immunology, endocrinology, cell biology, genetics and heredity, pharmacology, and medicine and medical research; these areas were chosen based upon the courses included in the proposed program. Overall, the library's current periodicals holdings seem adequate to support an undergraduate program in biomedical sciences. For each subject area, the library held 57-77 percent of the top 30 titles; the weakest areas were cell biology, biochemistry and pharmacology. The library's journal packages are particularly important for the proposed program. Elsevier's *ScienceDirect Freedom Collection*, which contains the full text of approximately 2,000 periodicals, provides extensive coverage of the biological sciences literature, including 120 pharmacology journals, 307 biochemistry, genetics and molecular biology titles, and 419 titles covering infectious diseases, health informatics, endocrinology, gastroenterology and other medical topics. *SpringerLink* provides online access to more than 400 Springer-Verlag journals in the biomedical and life sciences (of more than 1900 titles covering primarily the sciences and engineering). The Wiley-Blackwell collection consists of 1500 journals, including approximately180 titles in cell and molecular biology, 90 in microbiology and virology, 100 titles in genetics, 40 titles in anatomy and physiology, and hundreds of journals in medicine. In addition, the library maintains subscriptions to the 11 journals of the American Society for Microbiology and a number of titles from the American Physiological Society. Table 1 provides a sample of the library's current journals in biomedical sciences and related areas, drawn primarily from the *JCR* lists of highly-cited titles; this list is by no means exhaustive. In fact, the library provides access to more than eighty

percent of the periodicals listed in *Magazines for Libraries* as essential or important in the field of biology.

Further, the OUWBSM Library recently began subscriptions to a number of important resources that will be accessible to students and faculty in the proposed biomedical program. These resources include *MDConsult*, a collection of approximately 80 core medical journals, and the *Lippincott, Williams and Wilkins Complete Collection* of 280 medical, nursing and health sciences periodicals. The OUWBSM Library recently began a campus-wide subscription to the online version of *Science*, and will soon begin subscriptions to *Diabetes*, *Diabetes Care*, *Kidney International*, *Nature Medicine* and the *Annual Review* series in *Genomics and Human Genetics*, *Immunology*, *Neuroscience*, *Nutrition*, *Pathology: Mechanisms of Disease* and *Pharmacology and Toxicology*. With these and Kresge Library's own subscriptions to other *Annual Review* titles, students and faculty in the biomedical sciences program will have access to all relevant *Annual Review* titles. In addition, the OUWBSM Library plans to subscribe to *Endocrinology Reviews* (the top-cited journal in endocrinology) and *Clinical Pharmacology and Therapeutics*, a highly-ranked journal from Nature Publishers.

There are, however, a few important titles to which the library does not subscribe. Table 2 identifies highly-cited titles, drawn from the *2008 JCR*, to which the library does not have current access. The total subscription cost for all of these titles is well over $100K and many of these titles are published by Nature Publishing and Cell Press, both of which hold the distinction of publishing some of the most-cited AND most expensive titles in biomedicine. It should be noted that most of the journals from Nature Publishing are available full-text in the library's *Academic OneFile* database, and Cell Press titles are available on the ScienceDirect platform, but there is a one-year embargo on current content (i.e., the most recent year's issues are not available) for both Nature and Cell Press titles in these databases. Other biomedical titles also provide open-access to past, though not current, journal issues, maintaining 6-month to one-year embargoes on current content. The library provides access to the older volumes of these titles, as well, through its openURL linker (i.e., the Get It links).

As noted above, the OUWBSM Library will begin a subscription to *Nature Medicine* within the next year, and Table 3 lists other journals to which the library should subscribe in order to support the proposed program adequately. Because an online subscription to a Cell Press title is significantly more expensive than a print subscription, the print-only subscription for *Cell* is recommended. (For example, the cost of online access to *Cell* is more than $8,000, compared to a print subscription cost of $1,470.) These journal recommendations also include a title from Cold Spring Harbor Press in order to strengthen the library's weakest areas (biochemistry and cell biology). In addition, two titles from the American Physiological Society are included as recommended resources with additional funding (Table 5); they were not included in the primary list of recommendations because the library's journal holdings in physiology are fairly strong. All titles recommended by faculty in the Department of Biological Sciences have been included in the list and highlighted in grey. An estimate of costs for online subscriptions to these additional journals is included in the five-year library budget for the new program (Table 4).

Indexes

To access the journal and conference literature in the biomedical sciences, Kresge Library maintains subscriptions to a number of online indexes. The most extensive of these are *Science Citation Index* (available online through the *Web of Science* platform), which indexes journals from 1977 to present in the sciences*;* and *Medline* (via a number of platforms), which indexes the biomedical literature. In addition, the library has worked to include its openURL linker in *PubMed* (the free public interface for *Medline*) and Google Scholar so that researchers may access the full-text articles where available. The library also provides access to a few highly selective, limited coverage databases covering both academic and trade journal literature in the biological sciences: *Biological Sciences* (from Proquest), a database that covers the journal literature in biomedicine and other biology topics since 1982 that also provides a

rolling five-year coverage of TOXLINE, a database from the National Library of Medicine covering the toxicology literature; and *Biological and Agricultural Index* and *General Science Abstracts* (both via *FirstSearch*). Other relevant indexes include *CINAHL* (*Cumulative Index to Nursing and Allied Health Literature*) *Full Text*, an excellent resource for disease and general health topics; the *Cochrane Library*, containing systematic reviews of evidence-based medicine; and *PsycInfo*, the library's most extensive index to research in psychology, psychiatry and related disciplines.

A signal deficiency in our coverage of the life sciences, in an institution that offers degrees from the bachelor's to doctoral level in biologically-related areas, is a comprehensive index to the field. All of the other institutions that we reviewed for this collection analysis maintained subscriptions to *BIOSIS Previews* (*Biological Abstracts*), the most comprehensive and extensive database covering the biological sciences. This database is, however, rather expensive and it seems unfair that this one program budget for its purchase when its utility would be of surpassing importance to all of the university's biomedical programs. Another specialized index, *International Pharmaceutical Abstracts*, currently costs $4,712 per year. This database would provide excellent coverage of the pharmacological literature; however, a few Biological Sciences faculty indicated that *Web of Science* and *PubMed*/*MedLine* are sufficient for their own research needs, as well as that of their students. The costs for these two indexes are included in Table 5 (*Additional Resources*) should the department choose to fund them. Overall, though, the library's current index coverage seems sufficient for the proposed undergraduate program.

Monographs and Reference Materials

The library's monograph holdings related to the biomedical sciences will need to be supplemented to support the proposed program. In the past few years, the library has been forced to cut its spending on monographs in order to meet the inflationary increases of other resources (serials, databases) that have annual, ongoing costs. The average cost of basic sciences titles on the 2010 *Doody's Core Titles in the Health Sciences* (consisting of monographs and reference sources in anatomy, biochemistry, biostatistics, cell biology, epidemiology, immunology, microbiology, molecular biology, pharmacology, and physiology) is $137. Currently, there are 201 titles on the basic sciences list, for a total price of $29,764. Obviously, the library will not purchase every title on the list, but limiting the Doody's list to those titles considered "essential" in the basic sciences results in a list of 26 titles totaling approximately $3500. Funding for a subset of these and other titles is included in the library budget for the proposed program (Table 4).

A major source of biomedical monographic and reference works is the Springer eBook collection. To date, the library has purchased the 2005-2010 titles in the collection. This collection has more than 3,000 biomedical monographs and 40 reference sources, including the *Encyclopedia of Molecular Pharmacology* and the *Encyclopedic Reference of Immunotoxicology*. In order to support the biomedical sciences program adequately, it is crucial that the library continue to purchase these annual eBook collections.

Students and faculty in the proposed program will have access to a number of core science and medical textbooks through the OUWBSM Library's subscription to *MDConsult*, which includes textbooks such as *Gray's Anatomy*, *Guyton and Hall Textbook of Medical Physiology*, *Histology and Cell Biology*, *Berne and Levy Physiology*, *Principles of Medical Biochemistry*, *Thompson & Thompson Genetics in Medicine*, Mims' *Medical Microbiology* and *Brody's Human Pharmacology*. There are numerous other textbooks on cardiology, immunology and other topics.

Similarly, *AccessMedicine*, another recent acquisition by the OUWBSM Library, provides online access to core medical textbooks such as *Harrison's Principles of Internal Medicine* and *Goodman and Gilman's The Pharmacological Basis of Therapeutics*. The eBook collection in *AccessMedicine* also

includes monographs in the basic sciences and clinical science such as *Basic and Clinical Pharmacology*, *Endocrine Physiology*, *Pathophysiology of Disease* and *Greenspan's Basic and Clinical Endocrinology*.

The draft proposal for the new program notes that students will be required to take a course in pharmacology, and faculty in the biology department noted that the library's pharmacology reference sources should be expanded. Both *MDConsult* and *AccessMedicine* provide drug monographs online and *UptoDate*, a third database from the medical library, includes Lexi-Interact Online, a drug-to-drug, drug-to-herb, and herb-to-herb interaction analysis program. The OUWBSM Library also plans to subscribe to *Micromedex*, a pharmacological reference source that provides in-depth drug monographs. Still, faculty in the Department of Biological Sciences have provided a list of recommended drug reference books that would be useful to support the program. Funding for the digital versions (whenever possible) of these and other texts is included in library budget for the proposed program (Table 4).

Other Needs

Table 4 includes funding to cover anticipated annual inflationary cost increases for the library's current journals and research databases (historically averaging eight percent or more per year) that would support the proposed biomedical sciences undergraduate program. Without additional funding to cover inflationary increases each year, the library cannot guarantee that we will be able to continue to subscribe to our current resources. Therefore, we ask that the library be given funds each year to assist us in maintaining these important resources.

C: Julie Voelck, Dean, Kresge Library
Beth Kraemer, Libarian Liaison to the Department of Biological Sciences
Anne Switzer, Library Representative to the University Senate

Appendix C

Table 1

A Sample of Current OU Journals in the Biomedical Sciences

Journal Title	Publisher
Analytical Biochemistry	ScienceDirect
Biochemical and Biophysical Research Communications	ScienceDirect
Biochemical Journal	Portland Press/Biochemical Society
Biochemistry	Amer. Chem. Society
Biochemistry and Cell Biology	NRC Research Press
Biochimica et Biophysica Acta	ScienceDirect
BioEssays: Advances in Molecular, Cellular and Developmental Biology	Wiley-Blackwell
Biological reviews of the Cambridge Philosophical Society	Wiley-Blackwell
BioScience	U. California Press
BMC Biology	BioMed Central
BMC Cell Biology	BioMed Central
BMC Developmental Biology	BioMed Central
BMC Genetics	BioMed Central
Canadian Journal of Microbiology	NRC Research Press
Current Microbiology	Springer
Development	Co. of Biologists
Developmental Biology	ScienceDirect
EMBO Journal	Nature
Evolution: International Journal of Organic Evolution	Wiley-Blackwell
Experimental Cell Research	ScienceDirect
FASEB Journal	Highwire
FEBS Journal	Wiley-Blackwell
FEBS Letters	ScienceDirect
Genetics	Genetics Society of Am.
Genetics	Genetics Society of Am.
Heredity	Nature
Human Biology	Project Muse
Journal of Bacteriology	Am. Society for Microbiology
Journal of Biochemistry	Oxford UP
Journal of Biological Chemistry	Highwire
Journal of Biology	BioMed Central
Journal of Cell Biology	Rockefeller U. Press
Journal of Cell Science	Highwire
Journal of Eukaryotic Microbiology	Wiley-Blackwell
Journal of Heredity	Oxford UP
Journal of Molecular Biology	ScienceDirect
Journal of Virology	Am. Society for Microbiology
Microbiology	Highwire
Microbiology and Molecular Biology Reviews	Am. Society for Microbiology
Molecular and Cellular Biology	Am. Society for Microbiology

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Molecular Biology and Evolution	Oxford UP
Molecular Genetics and Genomics	Springer
Molecular Genetics and Metabolism	ScienceDirect
Molecular Pharmacology	Am. Society for Pharmacology
Nature	Nature
Nature Medicine	Nature
Nucleic Acids Research	Oxford UP
Perspectives in Biology and Medicine	Project Muse
Pharmacological Reviews	Am. Society for Pharmacology
Proceedings of the National Academy of Sciences	Nat. Acad. of Sciences
Quarterly Review of Biology	U. Chicago Press
Reviews of Physiology Biochemistry and Pharmacology	Springer-Verlag
Science	Science
Systematic Biology	Oxford UP
Virology	ScienceDirect

Appendix C

Table 2
Highly Cited Journals[1] to which OU Does Not Have Current Access

Journal Title	Publisher
Annals of Medicine	Informa
British Journal of Pharmacology	Wiley-Blackwell
Cancer Gene Therapy	Nature
Cell	Cell Press
Cell Differentiation and Death	Nature
Cell Metabolism	Cell Press
Cell Stem Cell	Cell Press
Cellular Physiology and Biochemistry	S. Karger AG
Chronobiology International	Informa
Clinical Pharmacology and Therapeutics	Nature
Clinical Science	Portland Press
CNS & Neurological Disorders - Drug Targets	Bentham Science
Critical Reviews in Biochemistry and Molecular Biology	Informa
Current Biology	Cell Press
Current Drug Metabolism	Bentham Science
Current Medicinal Chemistry	Bentham Science
Current Molecular Medicine	Bentham Science
Current Opinion in Molecular Therapeutics	Thomson Scientific
Current Pharmaceutical Design	Bentham Science
Cytotherapy	Informa
Developmental Cell	Cell Press
Drug Metabolism and Disposition	Am. Soc. of Pharm.
Drug Metabolism Reviews	Informa
Endocrine-related Cancer	Bioscientifica
Endocrine Reviews	Endocrine Society
European Journal of Endocrinology	Bioscientifica
Expert Opinion on Biological Therapy	Informa
Gene Therapy	Nature
Genes and Development	Cold Spring Harbor Lab. Press
Genes and Immunity	Nature
Genome Research	Cold Spring Harbor Lab. Press
Immunity	Cell Press
Immunology and Cell Biology	Nature
International Reviews of Immunology	Informa
Journal of Bone and Mineral Research	Wiley-Blackwell
Journal of Cellular and Molecular Medicine	Wiley-Blackwell
Journal of Cerebral Blood Flow and Metabolism	Nature
Journal of Experimental Medicine	Rockefeller U. Press
Journal of Leukocyte Biology	Soc. For Leukocyte Biology
Journal of Medical Genetics	BMJ Publishing

Journal of Neuroscience	Society for Neuroscience
Journal of Nuclear Medicine	Society of Nuclear Medicine
Journal of Pharmacology and Experimental Therapeutics	Am. Soc. of Pharm.
Journal of Vascular Research	S. Karger AG
Molecular Biology of the Cell	Am. Soc. for Cell Biology
Molecular Cell	Cell Press
Molecular Interventions	Am. Soc. of Pharm.
Molecular Psychiatry	Nature
Molecular Therapy	Nature
Natural Product Reports	Royal Society of Chemistry
Nature Cell Biology	Nature
Nature Chemical Biology	Nature
Nature Clinical Practice: Endocrinology & Metabolism	Nature
Nature Genetics	Nature
Nature Immunology	Nature
Nature Reviews Drug Discovery	Nature
Nature Reviews Genetics	Nature
Nature Reviews Immunology	Nature
Nature Reviews Molecular Cell Biology	Nature
Nature Structural and Molecular Biology	Nature
Neuropsychopharmacology	Nature
Oncogene	Nature
Pharmacogenomics Journal	Nature
Physiological Genomics	Amer. Physiological Society
Physiology	Amer. Physiological Society
Radiology	Radiological Soc. of N. Am.
RNA	Cold Spring Harbor Lab. Press
Stem Cells	Wiley-Blackwell
Stress: The International Journal on the Biology of Stress	Informa

[1]According to the 2008 *ISI Journal Citation Report*.

Table 3

Recommendations for Additional Journal Subscriptions to Support the Proposed BS in Biomedical Sciences

Title	Publisher	Price[1]	GVSU	WMU	CMU	JCR Ranking[2]	JCR Subject Area[2]
British Journal of Pharmacology	Wiley-Blackwell	$ 3,670				18	pharmacology
Cell (print)	Cell Press	$ 1,470	x(print)	x	x (print)	1; 2	biochemistry; cell biology
Drug Metabolism and Disposition	Am. Soc. of Pharm.	$ 420	x			43	pharmacology
Genes and Development	Cold Spring Harbor Press	$ 1,680	x	x		3; 8	genetics; cell biology
Journal of Pharmacology and Experimental Therapeutics	Am. Soc. of Pharm.	$ 898	x	x		32	pharmacology
Molecular Interventions	Am. Soc. of Pharm.	$ 300				21	biochemistry
Nature Cell Biology	Nature	$ 2,670			x	5	cell biology
Nature Structural and Molecular Biology	Nature	$ 2,670	x			12; 13	biochemistry; cell biology
Total cost of additional journal subscriptions		$ 13,778					

Journals requested by Biological Sciences faculty

[1]Prices are for online access only, with the exception of prices for *Cell*, which is for print only.

[2]Journals with two ranking values are ranked in multiple subject areas.

Appendix C

Table 4

Library Budget for Proposed BS in Biomedical Sciences

	Year 1	Year 2	Year 3	Year 4	Year 5
Monographs & electronic reference titles[1]	$ 2,000	$ 2,100	$ 2,205	$ 2,315	$ 2,431
New journal subscriptions[2]	$ 13,778	$ 14,880	$ 16,071	$ 17,356	$ 18,745
Support for current biomedical resources[2]	$ 3,000	$ 5,400	$ 5,832	$ 6,299	$ 6,802
Total	$ 18,778	$ 22,380	$ 24,108	$ 25,971	$ 27,978

[1]Presumes the purchase of approximately 15 books per year, with a 5% annual inflationary increase.

[2]Presumes an 8% annual inflation rate

Table 5

Resources to Consider with Additional Funding

	Year 1	Year 2	Year 3	Year 4	Year 5
BIOSIS Previews (*Biological Abstracts*)[1,2]	$ 45,383	$ 13,000	$ 14,040	$ 15,163	$ 16,376
International Pharmaceutical Abstracts[1]	$ 4,712	$ 5,089	$ 5,496	$ 5,936	$ 6,411
Journals					
Molecular Cell (Cell Press - print)	$ 1,470	$ 1,588	$ 1,715	$ 1,852	$ 2,000
Physiological Genomics (Am. Phys. Society)	$ 327	$ 353	$ 381	$ 412	$ 445
Physiology (Am. Phys. Society)	$ 279	$ 301	$ 325	$ 351	$ 380

[1]Presumes an 8% annual inflation rate

[2]The Year 1 quote for *BIOSIS* includes the purchase of backfiles to 1990

APPENDIX D: Course Syllabi

BIO 308 Human Microbiology Lab Course Syllabus

Instructor: To be determined, XXX SEB, Phone: (248) 370-XXXX;
email: TBD@oakland.edu
Office hours: 1 hr/ week or by appointment
Laboratory: 10:00-11:55 TR, SEB 390/334

Course Description: Introduction to techniques used for growing, isolating, and handling microbes. A microscopic examination and identification of prokaryotic and eukaryotic organisms including pathogens.

Purpose: To learn some basic important microbiology techniques, to carry out a microscopic examination and identification of prokaryotic and eukaryotic organisms including pathogens as well as to develop independence in lab skills.

Required Text : Microbiology: A Laboratory Manual (9th Edition) Cappuccino and Sherman (2010). ISBN-13: 978-0321651334.

Grading: Attendance and performance 20%
Reports (6) 60%;
Final exam 20%

Reports: Reports are due at the beginning of next session. There will be one report every two weeks. Please type all reports and include required drawing(s).
***Strain names must be written in *Italic* letters. For example: *Escherichia coli* or *E. coli.*

Final exam: TBD

Lab safety: A lab coat is required. Wear close-toe shoes. Absolutely no food, gum or drink in the lab!!

Lab Topics

	How to observe microorganisms
	How to grow microorganisms
	How to isolate microorganisms
	How to count microorganisms: Quantitative techniques
	How to characterize microorganisms: Differential testing
	How to kill microorganisms: Control of pathogens
	Microscopic and Macroscopic observation of pathogenic organisms prepared slides and images

Syllabus for Bio 445

BIO 445 Principles of Evolutionary Medicine (4)

Course Description:
Bio 445 is the study of the principles of evolutionary biology and their integration into medically relevant topics which impact human health. Bio 492 is designed with the intent of educating students interested in careers in the medical professions (nursing, medical school, physician assistants, ect). Understanding the principles of evolutionary biology and their application to understanding human disease and medically relevant topics is critical for the future of medicine and related health fields.

Grades:
There are four lecture exams scheduled as requirements for the course. Three of the exams will be held during the term at the regular class periods. The fourth exam will be held during the final exam week. Each of the four semester exams is equally weighted. Class presentations as well as a term paper will be used for grade determination.

The following scale is used in determining grades:
90-100%= 3.6-4.0
80-89% = 3.0-3.5
70-79% = 2.0-2.9
60- 69% = 1.0-1.9
59% and below = 0.0

Required Material:
1. Principles of Evolutionary Medicine by Gluckman, Beedle and Hanseon. (Oxford University Press)

2. iClicker

Topics Covered:
The topics covered will include, but at not limited to:
General principles of evolution
Darwinian selection
Evolutionary developmental biology
Human evolutions
Microbial resistance to antibiotics
Viral evolution and the development of vaccines.

Syllabus for Bio 473

Biochemistry of Metabolism and Disease Course Syllabus (4) Fall 2014

Instructor: To be determined, XXX SEB, Phone: (248) 370-XXXX;
email:TBD@oakland.edu
Office hours: 1 hr/ week or by appointment
Lecture: 3:00-4:47 TR, XXXSEB

Course Description:

Biology 473 is a study of the major intermediary metabolism of vertebrates and principles and application of topics in medical biochemistry. The material this semester will be presented to further your understanding of the correlation between the function (physiology) of the organ systems that exist in the human body and how biochemical processes impact the function of the systems and organism that result in pathological states.
Biology 473 is designed with the intent of educating students interested in careers in the medical professions (nursing, medical school, physician assistants, etc) as well as those who are interested in the function of the human body. Biochemical processes underlie all physiological systems and function. Correctly functioning biochemical processes are required for the body to maintain homeostasis. Failure of the biochemical processes to maintain homeostasis results in the development of pathological conditions and disease. Each section will be summarized by applying the material presented to clinically relevant situations.

Grades:

There are four lecture exams scheduled as requirement for the course. Three of the exams will be held during the term at regular class periods. The fourth exam will be held during the final exam week. Each of the four semester exams is equally weighted. Class presentations will be used in grade determinations. Student presentations will be evaluated for content and presentation skills.

Required Material:

1. Medical Biochemistry: Human Metabolism in Health and Disease by Rosenthal and Glew. (Wiley).
2. Clinical Biochemistry by Gaw et al. (Wiley).
3. iClicker

Topics Covered:

The topics covered will include, but at not limited to:
Enzymes
Glycolysis
Pyruvate Dehydrogenase and the Tricarboxylic Acid Cycle
Electron Transport and Oxidative Phosphorylation
Pentose Phosphate Pathway
Glycogenesis and breakdown
Gluconeogenesis
Fatty Acid metabolism
Ketone body metabolism
Cholesterol Synthesis, Transport and Steroids
Integration of Metabolism and Pathological Conditions

Biology 475 Human Genetics Course Syllabus (4) Fall 2013

Instructor: To be determined, XXX SEB, Phone: (248) 370-XXXX;
email:TBD@oakland.edu
Office hours: 1 hr/ week or by appointment
Lecture: 3:00-4:47 TR, XXXSEB

Course Description:
Introduction to classical and molecular inheritance, genetic processes of humans with particular emphasis on human genetic diseases. Topics include gene mapping, genetic diseases, molecular screening. Prerequisites: Bio 207 or Bio 321, Bio 341.

Overview:
Biology 475 is an introduction to of the principles of modern genetics and application of topics in medical genetics. The material this semester will be presented to further your understanding of the correlation between the function of genetic mechanisms that exist in the human body and how these processes impact the function of the physiological systems in the organism that result in pathological states. Biology 475 is designed with the intent of educating students interested in careers in the medical professions (nursing, medical school, physician assistants, ect) as well as those who are interested in the function of the human body. Mutated genes, transcriptional errors, genetic imprinting, population genetics and related topics will be covered and how malfunctions in the normal genetic processes results in the development of pathological conditions and disease. Each section will be summarized by applying the material presented to clinically relevant situations.

Grades:
There are four lecture exams scheduled as requirement for the course. Three of the exams will be held during the term at regular class periods. The fourth exam will be held during the final exam week. Each of the four semester exams is equally weighted. Students will also be graded on class presentations and a term paper.

Required Material:
1. Human Genetic Diversity: Functional Consequences for Health and Disease by J. Knight (Oxford University Press).
2. An Introduction to Human Molecular Genetics: Mechanisms of Inherited Diseases by Paternak (Wiley).
3. iClicker

Topics Covered:
Topics to be covered include, but are not limited to:
Basic mechanisms of inheritance (DNA structure, sequencing, transcription, translation)
Mendelian Inheritance, alleles and traits
Mutations and polymorphisms
Linkage analysis
Cytogenics and structural genomic variations (polyploidy, trisomy, monosomy)
Translocations and Chromosomal rearrangements
Copy number and susceptibility to disease
Tandem Repeats (satellite DNA, microsatellite DNA, Unstable repeats and diseases)
Mobile DNA elements
SNPs, HapMap, and association studies

Biology 492 Scientific Inquiry- Laboratory Course Syllabus Fall 2013

Instructor: To be determined, XXX SEB, Phone: (248) 370-XXXX;
email:TBD@oakland.edu

Office hours: 1 hr/ week or by appointment
Lecture: 3:00-4:47 TR, XXXSEB

Course Catalog Description:
"Integrative laboratory based experience focused on a single medically relevant topic. Exercises will range from basic cell/biochemical to virtual simulations of physiological processes to data mining of available biomedical databases through societal impacts".

Course Description:
This course offering is for students interested in the medical fields (medical, dental, physician assistants, pharmacy, veterinary) the opportunity to utilize a laboratory based research experience focused on a single medically relevant topic.

Exercises will range from basic cellular, molecular and biochemical levels to virtual simulations of physiological processes and data mining of available biomedical databases. The students will have the unique opportunity to follow the scientific process from the formulation of a hypothesis through *in vitro* experimentation, *in silico* physiological simulations and then postulate about the impact on a patient population and design studies to test those ideas.

Grades:
Students will be graded on laboratory assignments and a final paper.
The following scale is used in determining grades:
90-100%= 3.6-4.0
80-89% = 3.0-3.5
70-79% = 2.0-2.9
60- 69% = 1.0-1.9
59% and below = 0.0

Topics Covered:
Topics to be covered include, but are not limited to:
Establishment of hypothesis
Experimental design
Cell culture
Genomic analysis
Proteomic analysis
Physiological simulations
Application of knowledge/clinical extrapolations

Biology 493 Integrative Pharmacology Course Syllabus

Instructor: To be determined, XXX SEB, Phone: (248) 370-XXXX;
email:TBD@oakland.edu
Office hours: 1 hr/ week or by appointment
Lecture: 3:00-4:47 TR, XXXSEB

Course Description:
Biology 493 is a compressed study of the principles and application of those principles in human pharmacology. The material this semester will be presented to further your understanding of the correlation between the function (physiology) of the organ systems that exist in the human body and how pharmacological agents are used clinically to treat pathological conditions. Biology 493 is designed with the intent of educating students interested in careers in the medical professions (nursing, medical school, physician assistants, ect) and those who are interested in the function of the human body.

Grades:
There are four lecture exams scheduled as requirement for the course. Three of the exams will be held during the term at regular class periods. The fourth exam will be held during the final exam week. Each of the four semester exams is equally weighted. Students will also be graded on class presentations and a term paper.

Required Material:
1. Goodman and Gilman's The Pharmacological Basis of Experimental Therapeutics 11th edition (McGraw-Hill)
2. iClicker
Recommended: Examination and Board Review Pharmacology by Katzung and Trevor. (Appleton & Lange)

Topics Covered:
Topics to be covered include, but are not limited to:
Basic Principles (drug receptors and pharmacodynamics, pharmacokinetics, biotransformation and metabolism, excretion routes)
Autonomic drugs
Cardiovascular renal drugs
Drugs with actions on smooth muscle
Drugs that act in the central nervous system
Drugs that treat diseases of the blood, inflammation and gout
Endocrine drugs
Chemotherapeutic drugs (antibacterial, antiviral, antiparasite, antifungal, cancer chemotherapy, Immunopharmacology)
Toxicology
Drug interactions
Special concerns for perinatal, pediatric, and geriatric pharmacology

Biology 499 Integrative Biomedicine and Disease

Course Syllabus Winter 2015

Instructor: To be determined, XXX SEB, Phone: (248) 370-XXXX;
email:TBD@oakland.edu
Office hours: 1 hr/ week or by appointment
Lecture: 3:00-4:47 TR, XXXSEB

Course Description:
Biology 499 is a course designed to enhance student proficiency with critical thinking skills, research, and communication skills (both oral and written). This course will use an active learning environment to investigate clinically relevant pathological conditions and investigate the cause, the current and future treatment options, the effects the diseases have on the culture and the ethical considerations of the treatments available for the conditions. Students will be expected to research pathological conditions, write papers, and give oral presentations on their topics. Students will also be expected to work in groups and critique other student's papers and presentations as well as participate in class discussions.

Grades:
Students will be graded on a total of 3 term papers and 3 presentations. Students will work in groups of 3 and each will be the major writer and presenter of one topic presentation and paper. All the students in the groups will receive the same grades on the assignments to which they are contributors.
Presentations are expected to be 15 -20 minutes with time for questions at the end of each presentation. Papers are expected to be 10-15 pages, double spaced with 12 point font.
There will also be a class participation grade based on attendance and involvement in the class discussions.

The following scale is used in determining grades:
90-100%= 3.6-4.0
80-89% = 3.0-3.5
70-79% = 2.0-2.9
60- 69% = 1.0-1.9
59% and below = 0.0

Required Material:
1. iClicker
Students will use the Internet and library resources to access the popular press, historical records, clinically relevant books and websites as well as PubMed and other scientific databases to gather the necessary information for the required assignments.

APPENDIX E: Letters of Support

Oakland UNIVERSITY

Office of the Vice Provost for
Grants, Contracts & Sponsored Research

Rochester, Michigan 48309-4401
(248) 370-2552 Fax: (248) 370-2973

Arik Dvir, Chair
Department of Biological Sciences
Oakland University
Rochester, MI 48309

September 9, 2010

Dear Arik,

I am writing to support your proposal for a Bachelor of Science in Biomedical Sciences. This is a good time to propose such a degree. Oakland University traditionally has a large number of students interested in premedical education, and this major should be very attractive to them. It will compliment both our new medical school (the Oakland University William Beaumont School of Medicine) and our three Biomedical Sciences PhD programs in Medical Physics, Health and Environmental Chemistry, and Biological Communication. Furthermore, the dramatic increase in the number of undergraduate students majoring in biology justifies a more specialized major aimed at the significant subset of those students interested in medicine.

There are several features of this program that I particularly like. I have always believed that doctors need a firm grounding in mathematics, including an all-important statistics class. As a physics teacher, I like the requirement that the introductory physics should be the more rigorous calculus-based sequence (PHY 151-152) rather than the algebra based physics that premed students traditionally take. Given all the difficult issues that arise in scientific research and modern medicine, students will benefit from the ethics course and the introduction to research design. I think the integrative Biomedical capstone class will serve as a great transition from undergraduate studies to medical school.

As director of the Center for Biomedical Research, I believe this program will further strengthen and enhance OU's position as a major force in biomedicine. I know many of the faculty in your department quite well, and I have complete confidence that the department is up to the task of implementing this program. The success of the Engineering Biology program indicates to me that your department knows how to initiate and nurture new undergraduate programs. I am prepared to support and assist your efforts in any way I can.

Sincerely,

Brad Roth

Brad Roth
Interim Vice Provost for Research
Director of the Center for Biomedical Research

OU WB School of MEDICINE
OAKLAND UNIVERSITY WILLIAM BEAUMONT

October 22, 2010

I am pleased to offer a letter of support regarding the proposal for the creation of a new undergraduate degree in Biomedical Sciences at Oakland University. I have read the proposed program of study, consulted with Professor Dvir, and solicited the advice of other Oakland University-based faculty of the Oakland University William Beaumont School of Medicine concerning this matter. The School of Medicine faculty who have had the opportunity to review the proposal for this new degree program believe there are 5 strengths of the proposal;

1) the program builds on the strengths of existing OU basic science departments composed of qualified faculty with experience in education and research,
2) the program provides students with a solid foundation for future employment in the healthcare and pharmaceuticals industries, as well as preparation for enrolment in graduate studies or professional school programs such as Human Medicine, Dentistry, and Veterinary Medicine,
3) the program provides a breadth of course offerings, allowing students to experience many disciplines that contribute to the student's ability to solve problems using an integrated approach,
4) the program requirement for a capstone experience encourages students to undertake an independent scholarly activity. Our faculty believe these types of activities are the most useful opportunity for students to learn to utilize their newly acquired knowledge and skills to identify and solve problems. These activities often require more time and resources than are available in the classroom, and
5) the proposed program may attract additional gifted and motivated students to Oakland University, providing a welcoming environment where their talents can best be nurtured. It is hoped that the focus of the proposed program is growth of enrollment at OU. The emphasis should be attracting additional well-qualified students to the campus, rather than to cannibalize quality students from existing OU programs.

It serves the best interests of the Oakland University William Beaumont School of Medicine to support **all Oakland University undergraduate and graduate programs** that graduate well-prepared students meeting the stringent requirements for admission to our School of Medicine. More importantly, we value students who have been challenged and instilled with a joy in learning. We believe that the course of program study outlined in the prospectus for the Biomedical

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Sciences degree program addresses those goals. We offer our firm support this proposed program.

Robert Noiva, Ph.D.
Associate Professor and Associate Dean for Education Programs
Oakland University William Beaumont School of Medicine
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Oakland UNIVERSITY

Department of Mathematics and Statistics

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Eddie Cheng
e-mail: echeng@oakland.edu

September 8, 2010

Professor Arik Dvir, Chair
Department of Biological Sciences
Oakland University
Rochester, MI
48309

Dear Professor Dvir:

This is a supporting letter regarding the Proposal for a New Bachelor of Science Degree Program in Biomedical Sciences by the Department of Biological Sciences (DBS). I have carefully reviewed this proposal. I believe the proposal is excellent and it is carefully crafted after a comprehensive and comparative study of similar programs in Michigan and in the country.

First, I would like to point out that the DBS has the experience in managing a large program of almost 900 majors. It also has a pre-med program in place for a number of years. In addition, it operates a successful graduate program leading to Masters and Ph.D. degrees. Its close ties with the Eye Research Institute further demonstrates its ability to conduct multidisciplinary research. Indeed, the DMS has a history of cooperation with other departments in the College of Arts and Sciences. Last year, through a grant from the National Institutes of Health initiated by Professor Brad Roth from the Department of Physics, the DBS together with the Department of Mathematics & Statistics and the Department of Physics conduct a joint search resulted in a new faculty member who specialization is in mathematical biology.

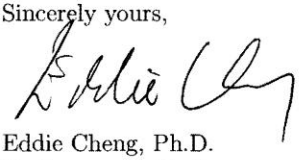
Although one of the central themes of this proposal is to prepare students to enter a MD program, the reality is that not all students will enter such a program. So I am particularly impressed that the program is designed for multiple options. With such a solid program under their belts, students have multiple options ranging from medical field to traditional research careers and everything in between.

Since I am not a biologist and in fact do not know too much about biology, I cannot comment on the rigor of the program directly. However, judging from the excellent research record of the faculty members in the DBS, the logical conclusion is that this is a 1st rate program. As mentioned earlier, the proposal is carefully crafted. I will provide one direct example. One of the required course is STA 228 Statistical Methods for Biology. This is new course for students in DBS and is a custom tailored and enhanced version of STA 225 (a generic version) specifically designed by our department at the request of DBS. I view this as an example of the vigor of their

proposed program.

I believe such a program in biomedical sciences complement nicely to our new medical school and the DBS is in a unique position to offer such a program. It is a carefully designed program that benefited from examination of other programs in the country, it draws strength from Oakland University and it is customized for students in Michigan. In short, I strongly support this proposal.

Sincerely yours,



Eddie Cheng, Ph.D.
Professor and Chair

Oakland UNIVERSITY

Department of Psychology

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September 15, 2010

Professor Arik Dvir, Chair
Department of Biological Sciences
Oakland University
Rochester, MI 48309

Dear Professor Dvir:

It is my pleasure to write this letter in strong and unequivocal support of the Department of Biological Sciences proposal for a new Bachelor of Science Degree Program in Biomedical Sciences. Not only is the proposed degree program innovative and timely, but also the Department of Biological Sciences is well-suited to effectively offer and manage this degree program. The proposed degree program offers students the opportunity to specialize their undergraduate studies in the biomedical sciences, but also ensures that students have broad exposure to the many other disciplines with which the biomedical sciences interface, including biology, mathematics, statistics, chemistry, philosophy, and psychology. This emphasis on breadth of studies is truly innovative and will set this program apart from similar programs in Michigan and, indeed, in the country.

The Department of Biological Sciences is well-positioned to offer this degree, with stellar faculty and a history of managing with impressive success first-class undergraduate and graduate programs in the biological sciences. The proposed program offers students the opportunity to focus their studies in a field that has grown at an astonishing pace, and one that is projected to continue to grow with new discoveries and advances in the biomedical sciences. Students that complete this degree are expected to have bright employment prospects, indeed. But more than that, this particular program encourages breadth of studies without sacrificing depth of studies. I can imagine students with a degree in the biomedical sciences who also are academically well-rounded will be especially attractive for many prospective employers or graduate programs.

I am delighted that students in the proposed degree program are required to complete two courses in psychology ("Foundations in Contemporary Psychology" and "Introduction to Research Design"). Based on the projected enrollment of the proposed degree program, I anticipate that the Department of Psychology would benefit greatly from the addition of a full-time tenure-track faculty member, which would service the new student enrollment in these core psychology courses, in addition to offering sections of the psychology courses designated as elective courses for the proposed program.

In summary, I strongly support the Department of Biological Sciences proposal for a new Bachelor of Science Degree Program in Biomedical Sciences. I look forward to assisting in the delivery of this innovative and timely program.

Sincerely,

Todd K. Shackelford, Ph.D.
Professor and Chair
Department of Psychology
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September 17, 2010

Arik Dvir, Chair
Department of Biological Sciences
Oakland University
Rochester, MI 48309

Dear Arik,

I am writing this to enthusiastically support your proposal for a Bachelor of Science in Biomedical Sciences. The proposal is well thought-out and timely.

I have reviewed the draft of the proposal (dated Sep 7, 2010) and agree that a B.S. program in Biomedical Science at Oakland University will help integrate a multitude of basic and clinical science disciplines and cultivate the students in developing a broad knowledge base and competency leading to an advanced career in biomedical science.

The nature of modern health and medical care requires, in the first place, a good grasp of theoretical and experimental Biology, and also of the basic and clinical sciences, broadly defined to include not only biomedical sciences, but chemistry, physics, mathematics and statistics, communication skills, and social and psychological knowledge. I believe that if Oakland were to offer a B.S. program in Biomedical Science, it will attract a larger number of qualified students who would have gone to other universities otherwise. The biomedical community needs people with interdisciplinary background that can meet the growing diversity and complexity of occupations that emerge in this field.

Oakland University will be ideally suited for offering this program and the proposed curriculum is well thought out. I strongly support this proposal.

Yours sincerely,

Andrei N. Slavin

Professor and Chair
Department of Physics
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Rochester, MI-48309

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John Halpin
Department of Philosophy, Chair

September 15, 2010

Professor Arik Dvir, Chair
Department of Biological Sciences
Oakland University
Rochester, MI 48309

Dear Professor Dvir,

I am very pleased to be able to review the proposal for a new degree program in Biomedical Sciences. I strongly support the proposal. After carefully reviewing the program description, I am convinced that it will serve students interested in either a medical professional career or research career in human biology. These students, focusing on careers in human-sensitive fields, will be especially well served by its integrative, interdisciplinary philosophy. For example, the required ethical component, PHL 103, serves more than a theoretical basis for research ethics concerns. This course presents the historical-cultural context for the development of ethical theory before applying these to a critical appraisal of contemporary moral issues.

But the ethics class is just one way in which the program's students are required to do critical thinking sensitized to cultural context. I am struck by the attention the program gives to psychological and social theory beyond moral reasoning. As well as the two required psychology classes, students will be "encouraged" to do work in anthropology and ethnic culture as well as elective work which may include further psychology. I am convinced that this would be of great significance to your targeted majors.

As a philosopher, I am impressed by the program's emphasis on theory of scientific practice, constant learning, and communications skills. I am not competent to speak to the natural science components. But this mature proposal is clearly thought out, well argued, and especially appropriate as Oakland County gears up as research and educational center for the state.

Sincerely,

John Halpin
Chair, PHL