The Ohio State University at Marion

Proposal for a Biology Baccalaureate Program
(B.S. and B.A., Pre-Health Professions Specialization)

Prepared by

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Approved by

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**I. Background and Rationale**

The biological sciences encompass a strikingly broad realm of human endeavor, from the tightly focused, information-rich and highly technical genomics/proteomics and personalized medicine to more holistic, interdisciplinary, and field-based specialties such as ecology and conservation biology. Accordingly, a biology degree program is likely to appeal to a substantial fraction of the incoming students to Ohio State Marion. More importantly and related to the wide range of interests represented in the biological sciences, an exceptional student with a biology degree will be equipped with a skill set of value and interest to a variety of potential employers, which may also serve as preparation for additional education. Specifically, an undergraduate with a biology degree will have advanced quantitative skills grounded in the pillars of methodological reasoning—chemistry and physics—and also be engaged with an area of nearly universal interest: life itself. Through the coursework, the student will have been tasked with assignments that draw heavily on reading comprehension, collaboration and research, and communication of science findings. In short, because skills and abilities are more transferable across disciplines than is knowledge, a biology student receives an excellent liberal education that is also rigorous, contemporary, and individualized. Such a student will be equipped for success in a diverse array of 21st century occupations.

**II. Motivation**

Earlier this academic year, the Marion campus EEOB faculty presented a proposal to the Marion Campus Academic Affairs Committee recommending that our campus offer all the courses necessary for a student to earn an Ohio State baccalaureate degree in biology. Offering this degree is an element of the Marion Campus Strategic Plan.

Chris Trapp, the campus’s Director of Academic Services, and Will Smith, the campus’s Coordinator of Career Services, have provided information from several sources that depicted a biology major as one that allows entry into occupations which are trending positive regarding employment prospects. With respect to our local situation, Matt Moreau, the campus’s Director of Enrollment Management, provided statistics showing that of the approximately 3,500 high school sophomores, juniors and seniors in our seven county service area who indicated a preference (out of a total of just over 5,000 students who were canvassed), 798 students picked biology/biological science, pre-medical or biomedical science, or showed an interest in other pre-professional programs that are consonant with a biology degree (pre-pharmacy, pre-veterinary, pre-dental, and pre-OT/PT). Majors chosen by current Ohio State Marion students show the same strong interest in biology and related disciplines (approximately 70 students, according to the most recent canvass). Attracted at least in part by the relatively strong job prospects in biomedical fields, prospective college students in our region and more broadly situated, indicate high interest in a biological science major.

Recognizing the high student interest in a biology major and the related disciplines for which this major could serve as a gateway, as well as the strong and varied skill set that such a degree program would provide, the proposal submitted by the EEOB faculty was approved by the Ohio State Marion Academic Affairs Committee. The Marion Campus Faculty Assembly has approved the proposal and recommended that it be carried forward through the appropriate university process. The Dean and Director and the Associate Dean of the Marion Campus also fully endorse this proposal.

**III. Degree Residence**

The Biology major resides in the Center for Life Sciences Education (CLSE), an interdepartmental program administered by the College of Arts and Sciences. CLSE also develops, teaches, and provides administrative support for certain heavily-enrolled core Biology courses, most notably the two 2-course sets of general introductory biology courses that include, for majors, Biology 1113 and 1114, and for non-majors, Biology 1101 and 1102. The Center also offers Biology 3401 (Integrated Biology), which is listed as a “core course” for all three specialization areas (Forensic Biology, Life Sciences Education, and Pre-Health Professions).

Most of the biological science course requirements for the Biology degree are drawn from offerings of other biology-related departments, which vary depending upon the specialization area of the Biology Major. As a result, courses from EEOB, Molecular Genetics, Chemistry and Biochemistry, Microbiology, Entomology, and Anthropology may be utilized for the Biology degree. According to the CLSE Mission Statement, the biology major is “designed to ensure exposure to a broad base of biological knowledge, to provide depth of experience in advanced topics, and to develop competence in scientific disciplines that are supportive of biological endeavors (mathematics, data analysis, physics, and chemistry).” It also notes that the major “provides a good background for graduate study (MS, PhD, MD/PhD) and is readily adaptable to meeting professional school requirements (medicine, dentistry, pharmacy, veterinary medicine, allied medicine, optometry, etc.), while also allowing freedom to take courses that satisfy secondary interests or alternative goals.”

**IV. Benefits**

Offering the Biology major will open the opportunity for area students to attend Ohio State Marion to complete a science degree in biology. Presently, a substantial number of such students with an interest in the sciences leave the area to pursue biology degrees elsewhere because a science degree is not available on this campus. Guidance and career counselors at local high schools have expressed enthusiasm for having biology BS/BA degree options on the Marion campus and they would recommend it to suitable students.

Currently Ohio State Marion offers all the courses needed for four-year degrees in History, English, Psychology, Education, Social Work, RN to BSN, and General Business. Having a four year science degree in biology will diversify our offerings and provide area students who are unable or unwilling to travel to Columbus or to other colleges and universities the opportunity to pursue their degree requirements in Marion. The four-year biology program currently is offered on the Lima campus, helping area student’s reach their educational goals.

The proposed program is also expected to strengthen other disciplines present on the Marion campus. We currently offer an early and middle school licensure degree program (BSED) in education and courses for the first two years of biomedical engineering and bioengineering. Having the Biology program on the Marion campus would provide opportunities for non-major students to take more biology courses and would diversify their educational experiences while at Ohio State Marion.

While developing our proposal for a Biology major, we evaluated all three-specialization areas (Forensic Biology, Life Sciences Education, and Pre-Health Professions). There are strengths inherent in each including, as has been noted, the breadth of applicable coursework that could contribute to a Life Sciences Education specialization. However, information from our Academic Services and Career Services indicated substantially greater student interest in the health sciences.

While we acknowledge that comparatively few students can be expected to enter the health professions as medical, dental or veterinary physicians *per se*, we believe that the health professions are growing and also are broad enough to justify investment in this educational sector. Moreover, many students fresh out of high school who are initially drawn to the study of biology because of perceived job opportunities in the health sciences field may simply be, as yet, unaware of the myriad of other ways to pursue a career in the life sciences. Thus in term of student interest, Pre-Health Professions was determined to be the best specialization choice for the Marion campus.

**V. Program Description**

The following courses constitute the Biology Major, Pre-Health Professions specialization, as it is currently constituted by the Center for Life Sciences Education.

**V (1). Supporting Courses (required for BA in any specialization area)**

Biology 1113 (Biological Sciences: Energy Transfer and Development; 4 units, lab required)

Biology 1114 (Biological Sciences: Form, Function, Diversity, and Ecology; 4 units, lab required)

Chemistry 1210 (General Chemistry I; 5 units, lab required) or 1610 (General Chemistry for Majors I; 5 units, lab required) or 1910H (Honors General Chemistry I; 5 units, lab required)

Chemistry 1220 (General Chemistry II; 5 units, lab required) or 1620 (General Chemistry for Majors II; 5 units, lab required) or 1920H (Honors General Chemistry II; 5 units; lab required)

Chemistry 2310 (Introductory Organic Chemistry; 4 units) or 2510 and 2520 (Organic Chemistry I and II; 4 units each)

 Math 1148 (College Algebra; 4 units) and 1149 (Trigonometry; 3 units) or 1150 (Pre-calculus; 5 units)

Physics 1200 (Mechanics, Kinematics, Fluids, Waves; 5 units, lab required) or 1250 (Mechanics, Thermal Physics, Waves; 5 units, lab required)

**V (2). Supporting Courses (required for BS in any specialization area)**

Biology 1113 (Biological Sciences: Energy Transfer and Development; 4 units, lab required)

Biology 1114 (Biological Sciences: Form, Function, Diversity, and Ecology; 4 units, lab required)

Chemistry 1210 (General Chemistry I; 5 units, lab required) or 1610 (General Chemistry for Majors I; 5 units, lab required) or 1910H (Honors General Chemistry I; 5 units, lab required)

Chemistry 1220 (General Chemistry II; 5 units, lab required) or 1620 (General Chemistry for Majors II; 5 units, lab required) or 1920H (Honors General Chemistry II; 5 units; lab required)

Chemistry 2510 (Organic Chemistry I; 4 units) or 2610 (Organic Chemistry for Majors I; 4 units) or 2910H (Honors Organic Chemistry I; 4 units)

Chemistry 2520 (Organic Chemistry II; 4 units) or 2620 (Organic Chemistry for Majors II; 4 units) or 2920H (Honors Organic Chemistry II; 4 units)

Chemistry 2540 (Organic Chemistry Laboratory I; 2 units) or 2940H (Honors Organic Chemistry Laboratory I; 2 units)

Chemistry 2550 (Organic Chemistry Laboratory II; 2 units) or 2950H (Honors Organic Chemistry Laboratory II; 2 units)

Math 1151 (Calculus I; 5 units) or Math 1156 (Calculus for the Biological Sciences; 5 units)

Math 1157 (Mathematical Modeling for the Biological Sciences; 5 units) or Stat 2480 (Statistics for the Life Sciences; 3 units); the campus would substitute this course by Math 1152/1172.

Physics 1200 (Mechanics, Kinematics, Fluids, Waves; 5 units, lab required) or 1250 (Mechanics, Thermal Physics, Waves; 5 units, lab required)

Physics 1201 (E&M, Optics, Modern Physics –algebra based; 5 units, lab required) or 1251 (E&M, Optics, Modern Physics –calculus based; 5 units, lab required)

**V (3). Core Course (required for Pre-Health Professions specialization)**

Biology 3401 (Integrated Biology; 4 units)

**V (4). Required Course (required for Pre-Health Professions specialization)**

Molecular Genetics 4500 (General Genetics; 3 units) or 4606 (Molecular Genetics; 4 units)

**V (5). Additional Coursework (**At least 4 must be chosen. Of the 32 semester units, 25 units must be courses in Biochemistry, Biology, EEOB, Microbiology, or Molecular Genetics.**)**

Biochemistry 4511 (Introduction to Biological Chemistry, 4 units) or 5613 (Biochemistry and Molecular Biology I, 3 units) and 5614 (Biochemistry and Molecular Biology II; 3 units)

EEOB 3310 (Evolution; 4 units)

Microbiology 4000 (Basic and Practical Microbiology; 4 units, lab required) or 4100 (General Microbiology; 5 units, lab required)

EEOB 3510 (Cellular and Developmental Biology; 3 units) or MolGen 5607 (Cell Biology; 3 units)

EEOB 3520 (Microscopic Anatomy; 3 units, lab required)

Anatomy 2300.01 (Human Anatomy; 4 units, lab required) or Anatomy 3300 (Advanced Human

Anatomy for Undergraduates; 5 units, lab required), or EEOB 2510 (Human Anatomy; 3 units, lab required)

EEOB 4510 (Comparative Vertebrate Anatomy; 3 units, lab required)

PhysioCB 3101 (Human Physiology I; 3 units) and PhysioCB 3102 (Human Physiology II; 3 units) – or EEOB 2520 (Human Physiology; 3 units) or EEOB 4520 (Comparative Physiology; 3 units)

**VI. Staffing**

In addition to the two regular, tenure track faculty in EEOB, Ohio State Marion has tenure-track faculty members in mathematics, chemistry, physics, earth science, anthropology, and in most subject areas of humanities and social sciences. Existing Marion campus faculty can teach more courses in non-biology disciplines in addition to what is currently being offered. It should be noted that the campus already offers all of the “Supporting Courses” listed above in V (1) and V (2), except Math 1157 and Statistics 2480. The campus has received permission to offer Math 1152/1172 as their substitute until it builds enough enrollments in the Biology program. Currently we offer Math 1172 every semester. Six courses in the V (3), V (4) and V (5) “Core,” “Required,” and “Additional” courses areas that would need to be staffed.

Ohio State Marion’s two tenure track faculty members in EEOB, Bob Klips and Susan Gershman, are evolutionary biologists within EEOB specializing in plant and animal reproductive ecology, respectively. Their present strengths are in the areas of evolution (one class required for the pre-health professions specialization) and various aspects of evolution and organismal diversity (not required for the pre-health professions specialization, but eligible for elective credit). In addition to the two tenure track faculty, the campus employs two associated faculty who teach introductory biology courses and/or EEOB 2510 (Human Anatomy) and EEOB 2520 (Human Physiology). However, not all courses needed for the Biology degree can be instructed by existing Marion campus faculty. Given the emphases on vertebrate anatomy, vertebrate physiology, and microbiology, it is apparent that the hiring of additional EEOB faculty members would be targeted towards people having the ability to teach in those areas.

As part of the support for this proposal, the Marion Campus Academic Affairs Committee has recommended, and the Marion Campus Faculty Assembly has approved, hiring an additional tenure track faculty member. The Marion Campus Dean and Director, Greg Rose, and Associate Dean, Bishun Pandey, also fully support hiring a third regular faculty member. Following approval of this proposal by the NMS area of ASC and CSLE, and final approval from the Council on Academic Affairs (CAA), the Marion Campus would begin the faculty search in coordination with the appropriate TIU. This hire would be targeted towards a sub-discipline of biology, such as vertebrate evolutionary physiology, that is not well represented by the two regular faculty currently on campus. This would increase our number of biology faculty members and also provide an opportunity to offer more diversified course offerings. The campus anticipates, and has outlined a plan for, hiring additional faculty in the future as the program grows.

The following table illustrates which faculty could teach courses not currently offered and how each course could be used to fulfill degree requirements. (Note: in most or all of the instances where the designation “TBD” is used, it indicates a class that would be taught by new tenure track faculty.)

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| **Course** | **Faculty** | **Purpose of course** |
| Biology 3401 | Gershman, Klips | Core Course |
| Mol Gen 4500 | TBD | Required Course |
| EEOB 2510 (3) Lab course | TBD | Additional Coursework |
| EEOB 2520 (3) | TBD | Additional Coursework |
| EEOB 3310 (3) | Gershman/Klips | Additional Coursework |
| EEOB 2210 (2) | Klips | Major Elective |
| EEOB 3320 (3) Lab course | Gershman/Klips | Major Elective |
| EEOB 3410 (4) | Gershman/Klips | Major Elective |
| EEOB 3420 (3-4) | Gershman | Major Elective |
| EEOB 3520 (3) Lab | TBD | Additional Coursework |
| EEOB 4230 (2) | Gershman | Major Elective |
| EEOB 4510 (3) Lab | TBD | Additional Coursework |
| EEOB 4998 (1-12) | Gershman/Klips/TBD | Major Elective (up to 3 hrs. can count as a lab course) |

At this time, Ohio State Marion does not offer Microbiology 4000 and Molecular Genetics 4500. The campus is planning to offer both courses on regular basis. Regarding the lab components of Microbiology 4000, our lab assistants have visited the Microbiology lab on the Columbus campus and have received the list of equipment and apparatus. The campus plans to buy the necessary lab equipment and offer these courses in Autumn Semester 2016 and onward.

For Biochemistry 4511, Molecular Genetics 4500, and Microbiology 4000, we do not have instructors identified. We will seek assistance from the respective departments to have an OSU approved faculty member to teach these courses. One of our chemistry faculty members, who had been teaching for us as a senior lecturer for the last eight years, has expressed interest in teaching Biochemistry 4500. Nevertheless, it is generally a practice at the Regional campuses to engage academic departments in identifying instructors for such courses. In some cases, the regional campuses hire visiting assistant professors to staff such courses.

Since Marion is not a campus listed as offering most of the courses in the list above as well as Microbiology 4000, we will request the respective departments to approve Marion to offer these courses. To ensure the course content, rigor and expectations remains same and Marion students gain similar experiences as students on Columbus and other campuses where the courses are offered, the campus will seek assistance from the respective departments regarding syllabi, procedures, and equipment.

An assigned Marion campus advisor with experience advising students in the Biological Sciences will continue to assist students pursuing a biology degree. As is the current practice, Marion advisors will work closely with Columbus campus advising staff for any clarification that may be needed or assistance with students who are transitioning to the Columbus campus.

Four-year sample curriculum plans (one each for the B.S. and B.A.) are attached. We propose to offer first and second year courses in Autumn 2014-15 and third year begins in Autumn 2015-16. Courses listed in sample plan will be offered every year. We will like to add that Psychology 3313 is offered every Spring Semester for our BA in Psychology program. Similarly, Biochemistry is offered every Spring Semester to fulfill the requirements for other programs (it was cancelled in spring 2014 due to low enrollment).

**VII. Physical Resources**

Presently, the Marion Campus has one dedicated biology lab and a 10-acre reconstructed tallgrass prairie, which are maintained by two science lab support personnel. A long-pursued initiative to construct a new science and engineering building is presently in the advanced pre-design stage. Internal campus reserves and development funding provided by community donors have been combined to provide a funding source totaling approximately $15 million, sufficient to move the building to the top of the Marion campus capital needs inventory. Ohio State’s Planning Office has just completed an updated feasibility study for the building. Specifically in support of the facilities needs for the program outlined in this proposal, the plan includes two new biology laboratories, lab preparation space, a greenhouse, and small research labs for biology faculty. The campus will propose this project for approval by the Ohio State University Board of Trustees as part of the university’s annual Capital Improvement Plan during Summer 2014. An architectural firm would be hired shortly thereafter to begin detailed planning, with the goal of opening the new building by Autumn, 2017.

**VIII. Summary**

In sum, having a BS/BA biology degree with the pre-health professions specialization available in full at Ohio State Marion seems to have both the greatest appeal and the broadest utility, and is the one the campus wishes to adopt. This program would appeal to students with an interest in pre-medicine, while also providing a solid grounding in biological principles and practices that could be put to use in life sciences generally. It would also form the basis of an undergraduate specialization area for future educators, without unduly focusing on that contingent of students. The addition of a four-year program in biology would address the requests from area school counselors and principals and assist the Marion campus in meeting the needs of the local community, one of the key reasons behind establishment of the regional campus in 1957.

Thank you very much for consideration of this request. Please do not hesitate to ask for clarification or additional information.