CURRICULAR PROPOSAL FOR CELL AND MOLECULAR BIOLOGY MAJOR
BIOLOGY DEPARTMENT

Rationale for the Major in Cell and Molecular Biology

Recruitment of new students to JCU

Presently, both the Biology Department and Chemistry Department at JCU train many students interested in pursuing health-related professions. These students frequently major in Biology or Biochemistry (the new name for the Chemistry Life-Sciences Major). We clearly wish to continue to attract students to these majors, providing critical pre-professional training for health-related careers and for students who plan to enter Ph.D. programs in these fields. We have a concentration in Biochemistry/Molecular Biology, and enrollment in this program has been regular but small (6-8 graduates/year). We feel that a new major in Cell and Molecular Biology will increase our program's visibility and serve to attract a new group of students to the university.

The majors in biology, biochemistry, and cell and molecular biology, as well as the concentration in biochemistry/molecular biology have a large overlap in required courses. We feel that this new major increases options for incoming and transfer students. All three majors, the environmental sciences major (separate proposal) and the biochemistry/molecular biology concentration can be decided in the second semester of the sophomore year if students have been enrolled in the year long sequences in biology and chemistry beginning in their freshman year. The first two years of coursework apply to all these majors and the concentration.

The intent of this major is at least in part to attract more students to John Carroll University and thus is consistent with current efforts to increase enrollment. Additionally, this program may serve students that realize in their sophomore year that they may want to pursue a career in cell and molecular biology research. The coursework in this major will well prepare students to enter graduate programs in either basic science or applied health sciences. The major will serve to prepare students for the health professions, and as a rigorous major may actually provide an edge in the competitive process of gaining admission to medical school.

Cell and Molecular Biology in the context of University Mission

We consider this program to build on John Carroll's commitment to improving the world and training students to value service. Much of the medical research conducted presently is based on cell and molecular biology, and students going on to graduate programs in this area may end up advancing science which has a direct impact on medicine. We are hopeful that some students will go on to become college or university instructors following graduate training, and we consider this to also be a service career.

Assessment Plan

To assess the success of the program we will track the number of students entering into and graduating from the program. Additionally, we will track where students intern, and where they obtain positions as graduate students or career professionals. Prior to graduation, all students in the program will be required to take a comprehensive exam over the material covered in the required courses. This exam will replace the MFAT exam used for the Biology major, as no comparable exam exists in Cell and Molecular Biology of which we are aware.

History of the Proposal

The development of a Cell and Molecular Biology major grows out of a 15 year effort to expose our students to an area of science that has seen dramatic technological growth and breadth of application extending across numerous sub-disciplines in the fields of Biology and Chemistry. Beginning with a single lecture and a single laboratory course taught in the Biology Department, opportunities expanded with inter-departmental cooperation between the Biology and Chemistry Departments to develop the Biochemistry/Molecular Genetics concentration. The addition of a second faculty member trained in Molecular Genetics has allowed the Biology Department to increase the number and frequency of cell and molecular courses. Cooperation between the molecular geneticists in the Biology Department and the biochemists in the Chemistry Department provides a rich on-campus learning environment. JCU faculty members have established good relationships with research faculty at the Cleveland Clinic Foundation and each summer Biology majors have been awarded summer internship opportunities at the Cleveland Clinic.

Three members of the Biology Department (Drs. Flechtner, Lissemore and Martin) were excited about the possibility of developing a Biology major which would be inter-disciplinary including courses from Biology, Chemistry, Mathematics and Physics. They wanted to design a rigorous major which would prepare highly motivated students for future studies in the health care professions and graduate school. They looked for similar offerings at other institutions, met several times together to develop a preliminary proposal and outline of proposed courses and conferred with Drs. Chai and Mascotti of the Chemistry Department. The proposal was brought before and discussed among the entire Biology Department. Suggestions for change from this meeting were evaluated, and an additional round of discussions were held with Drs. Chai and Mascotti, changes were made in the proposal, and a second meeting was held. At the end of this process the Biology faculty agreed to the proposal outlined in this document. Dr. Mascotti also presented the proposal to the Chemistry Department.

A Cell and Molecular Biology major of this scope is unusual for a school of John Carroll's size. However some similarly sized colleges (e, g. Wooster) offer tracks within the major similar to that suggested here. We feel that this major makes the Biology program at JCU distinctive and has the potential to attract strong science students with a

particular interest in learning modern research techniques. Courses required for this major are presented in Table 1.

Implementation of the cell and molecular biology major and resource allocation

No new resources are necessary to implement this major. The Biology courses required for the major are already offered in the Biology Department. The Mathematics (MT 135 and 228) and beginning Chemistry courses (CH 141-144 and 221-224) required by the Cell and Molecular Biology major are they same courses required by the current Biology major. Although Physics is not currently required for a Biology major, one year of Physics is required for medical, dental and many graduate programs. We envision that the caliber of student attracted to this major would choose to take Physics whether or not the course was required in order to satisfy requirements for post-graduate study.

The requirement for one year of biochemistry could have an impact on the chemistry Department offerings. Currently many students planning post-graduate work in health science careers or Ph. D. programs take biochemistry; many Biology majors choose CH431, a one semester general biochemistry course; this course is consistently heavily enrolled. The requirement by the Cell and Molecular Biology major for the two semester sequence (CH 435 and 436) which typically has much lower enrollment (20-25 students) than CH 431 (35 or more students) could alleviate pressure on CH 431.

New staffing and resource allocation to the Cell and Molecular Biology major are not necessary for the establishment for a viable program. When a faculty line becomes available as a retirement replacement, the Department overall needs are such that the area of expertise of the replacement would be in an area which would support the major (microbiology, infectious disease, immunology). If the new program should prove to be very successful in the recruitment of students so that Biology Department enrollment increases appreciably, the request for a new faculty line and/or resources may be appropriate.

Projection of anticipated enrollments

The development of a cell and molecular biology major contributes to the quality and integrity of the Biology Department's successful pre-med program and diversifies offerings available. Our primary goal is to attract students with a different primary interest in biology compared to our current, typical Biology major. We project that eventually 10-20 students will enroll in this program. Most of the impact, in terms of student numbers, will be felt by the Biology Department, and we may need to offer additional sections of Molecular Methods Laboratory (BL 470) and Molecular Genetics (BL 465) when we get more than 12 graduates/year .

Table 1. Proposed Curriculum for Cell and Molecular Biology Major

Required Courses	*Credits*
BL 155-158 Principles of Biology I and II	8
BL 213 Genetics	4
BL 215 Biotechniques or BL 470 Molecular Methods Laboratory	3
BL 301 Cell Biology or BL 459 (Molecular Cell Biology)	3-4
BL 465 Molecular Genetics	3
CH 141-144 General Chemistry I and II	10
CH 222-225 Organic Chemistry I and II	8
CH 435, 436 Biochemistry I and II	7
CH 437 Biochemistry Laboratory	1
MT 135 Calculus and Analytical Geometry I	4
MT 228 Biostatistics	3
PH 125, 125L, 126, 126L General Physics I and II	8
Additional Courses (Two additional courses from the following list)	
BL 159, 160 Principles III	4
BL 301 Cell Biology	4
BL 310, 310L Microbiology	4
BL 410 Infection and Immunity	3
BL 471 Immunology	3
BL 475 Endocrinology	3
BL 399 Special Problems in Biology or CH 399 Undergraduate Research	3
BL 459 Molecular Cell Biology	3
BL 470 Molecular Methods Laboratory	3

Total credit hours for major is 68-71 credits

For comparison purposes: Biology Major
34 hours BL, 18 hours CH, 7 hours MT
Total is 59 credits (67 with Physics)
Total required for non-science core is 47 credits
Total remaining for other topics (non-major, non-core) is 22 credits

Environmental Sciences Major
38 hours BL, 10 hours CH, 7 hours MT, 8 hours PH, 3 hours PO/SC
Total is 66 credits (74 with Organic Chemistry)
Total required for non-science core is 47 credits
Total remaining for sciences and other topics is 15 credits