Bachelor of Science in Integrated Sciences
Degree Description
January 9, 2012

The College of Arts and Sciences and the College of the Environment at the University of Washington propose to create a new Bachelor of Science degree in Integrated Sciences. This degree is intended to meet the needs of undergraduates planning careers in secondary science teaching, informal science education at museums or other science institutions, science writing, or science policy and technology law, as well as students whose intellectual interests incline them toward a rigorous program of study across all the sciences. Such students require knowledge of a range of sciences, an in-depth understanding of what the process of science is, an appreciation of the ethical and social contexts in which science is done, and the ability to approach a scientific problem by drawing from and integrating knowledge from a variety of scientific fields. This contrasts with the more narrowly focused, in-depth program typical for students majoring in a single discipline in preparation for graduate study and research in that field.

The two distinctive features of the Integrated Sciences program are its focus on providing students with an intensive research experience and its expectation that students will come to understand the historical, social, ethical, and epistemological dimensions of science. They will not only learn scientific truths, but also come to understand how scientific truth is established and participate in the process. Moreover, by studying a range of sciences, they will be better positioned to engage in work that crosses disciplinary boundaries or is part of new scientific fields.

It is important to emphasize that this is a degree in science, not in science education or science writing or science policy. Graduates will have the science background for such careers, but further professional study specific to those careers will be necessary. A prospective science teacher, for instance, upon receiving the BS in Integrated Sciences, might next enroll in UW's Secondary Teacher Education Program for a Master's in Teaching plus science teaching certification.

The proposed degree program will be rigorous, drawing from courses in mathematics and the biological and physical sciences plus newly designed integrative courses and a research experience. There are four components:

1. Basic Science and Mathematics (60 credits). Students will take two or three quarters from the standard introductory sequences in mathematics, physics, chemistry, biology, and earth and space sciences that are offered to majors in those fields. These courses collectively will give students extensive laboratory experience and opportunities to observe various fields joining together to address common problems. They provide the essential foundation for all that follows.

2. Disciplinary Track (18 credits minimum). An integrated science student will select one field of specialization from among Aquatic and Fishery Sciences, Astronomy, Atmospheric Sciences, Biology, Chemistry, Earth and Space Sciences, Environmental and Forest Sciences, Oceanography, and Physics. In that field, the student will take at least 18

credits of course work from an approved list of courses designed for the discipline's majors. A list of recommended programs of study and advice from program counselors will ensure coherence in the course selection. Through this component, the student will acquire an in-depth understanding of the problems and techniques typical of the given discipline to a level sufficient to participate in research in that discipline or allied ones.

3. Integrated Sciences Core (13 credits). Four new courses are being designed for the degree program. These courses will bring the majors together as a cohort and give them a rich perspective on the scientific process and its societal significance.

    i. IntSci 301, Integrated Sciences Seminar (1 credit). The seminar will introduce students to scientists or science educators who are actively engaged in careers that require an integrative science perspective. The focus will vary from quarter to quarter, with sessions devoted to educational issues, law, policy, and similar topics. In Spring 2011, the seminar was run on a pilot basis with an education focus. Classroom guests included middle school science teachers, high school science teachers, science educators from the Pacific Science Center in Seattle, curators and staff from the Burke Museum of History and Culture on the UW campus, science writers, and more. In addition, each student visited a museum, school, or other institution to explore its work in more detail.

    ii. IntSci 401, Integrated Sciences Practicum (2 credits). The practicum will provide students with the opportunity to explore professional opportunities in formal or informal science education, science writing, science policy, or other areas that require an integrated science perspective. Each student will prepare a one page proposal of a 50-hour practicum experience, in consultation with the program advisor and a practicum supervisor. Approval by the program director is required. Examples include weekly visits to a science classroom, volunteer work at a science or natural history museum, or participation in a science education partnership with a local, regional, or national science research institution or agency. The student will prepare a two-to-three page written report on the experience, identifying the role played by a broad science background and insights gained on the role of science in society. In addition, the student will make a ten-minute oral presentation to the students of an IntSci 301 class.

    iii. IntSci 402, Nature of Science (5 credits). This course will typically be co-taught by a scientist and a philosopher or historian, with topics to include the underlying principles of science, methodologies of science, the differences between invention and discovery, science ethics, science versus other ways of knowing, and the communication of science. Typically, a given scientific theory of historic importance, such as the theory of continental drift, will serve as source material, with students exploring the scientific issues themselves as well as questions regarding initial resistance to the theory and its ultimate acceptance.

    iv. IntSci 403, Science in Context (5 credits). This course will typically be co-taught by a scientist and a social scientist with an interest in science from an ethical or

societal perspective, and will focus on a case study examination of how science operates within broad social, political, and ethical contexts. The course will consider the growth of multidisciplinary and interdisciplinary research, the societal impact of scientific results and developed technologies, the political environment surrounding scientific practice, ethical responsibilities of scientists, the acceptability of censorship, the complex mechanisms for funding scientific research, and the power inherent in claims to knowledge. Topics for case study may include global climate change, evolution, and stem cell research.

These courses complement the disciplinary track courses that students will be taking at the same time, both in providing students an opportunity to examine scientific issues outside the given track and in giving the students the tools to make better sense of the scientific knowledge they are studying in their disciplines and how that knowledge was developed. This is an important feature of the program's integrative experience.

4. Capstone Research Experience (15 credits). This is the heart of the program. Each student will participate in scientific research with a faculty member in a lab or in the field for 6 credits while taking, in parallel, a new sequence of integrated science seminars:

   i. IntSci 491, Introduction to Research (2 credits). This course will prepare students for an intensive scientific research project. It will include discussions of what constitutes scientific research, development of a research proposal in conjunction with research mentor and the course instructor, and presentation of the research proposal.

   ii. IntSci 492, Reflections on Research (2 credits, taken twice). Students will take this course while participating in an ongoing research project. It will center on discussions of student research, data collection, and data analysis. The format will include formal and informal discussions, short papers and oral presentations.

   iii. IntSci 493, Communicating Research (3 credits). Students will take this course near the end of or after completing their research projects. They will prepare their research findings for oral and/or written communication, working closely with their research mentor and instructor to prepare class and symposium presentations, research papers, or other forms of publication.

   The combination of the research itself and these three seminars is crucial to the anticipated success of the capstone experience. Through the seminars, students will acquire a deeper understanding of the research process in which they are participating. Moreover, by meeting with others in their cohort, they will obtain a broader perspective on the challenges of doing and communicating research while simultaneously getting insight into the nature of scientific research in other fields.