April 8, 2014

TO: Beverly Nagel, Dean of the College
RE: Request for new tenure-track faculty

Dear Bev,

One of the prominent items in our recent departmental review was the replacement of two faculty members. I have attached the relevant pages from our document that outlines the strategy of how these two new hires would be instrumental in helping us maintain a strong curriculum that reflects the study of modern biology. As you are aware, we delayed the request for Nidanie Henderson’s replacement until we had the opportunity to fully discuss all the possibilities, and receive feedback from our review committee. John’s announcement of retirement gave us even more pieces of the puzzle to work with as we carefully considered the future direction of the department. Although we have not yet received the final summary from the outside reviewers, we hope that you received some initial feedback concerning this very important issue for the Biology Department. Thank you for your consideration of this proposal.

Sincerely,

[Signature]

Stephan Zweifel, Chair of Biology
FACULTY HIRING

In order to maintain a curriculum that reflects the study of modern biology, and to provide research opportunities for students in a broad range of specialties, faculty retirements and departures provide an opportunity to shape the direction of the department. To this end, we propose hiring two tenure-track positions: the first position will provide expertise in Biochemistry and Computational Biology, and the second position will highlight Microbiology and Ecology. Both positions will also provide much needed support in our Introductory Biology courses.

One of the mechanisms by which a department can ensure that its course offerings are rich as well as current, is through the thoughtful replacement of its departing faculty. John Tymoczko, our biochemist, is saying farewell to the college. John’s impact on the department and the college over the past 37 years cannot be overstated. John was instrumental in shepherding the Biology department into the “molecular age”, and transformed the departmental and college culture towards a model of research active faculty. His contributions to teaching, research, and textbook writing have raised the national profile of the Biology Department as well as that of the College. John’s presence will be sorely missed.

In addition to John’s retirement, the department saw the departure of a tenure track junior faculty member two years ago. This position has not yet been replaced, as the department wished to use this review to carefully discuss how we plan to replace both of these positions. In a field as dynamic as biology, it is vital that we take this opportunity to reevaluate the state of the curriculum and research opportunities in our department. We therefore asked ourselves, what combination of courses and faculty expertise would best serve the Biology department and the college for the next several decades? Some of our guiding principles for defining the new faculty positions that will strengthen our curriculum include the following:

1) What are the foundational courses that must be offered in any Biology Department?

2) What emerging areas of modern biology are not adequately represented in the department?

3) How can we reduce the enrollment pressures on courses, and individual faculty, by hiring in disciplines that have a high student demand?

4) Can we design interdisciplinary overlap such that we can replace some of our courses internally when faculty are on leave, rather than repeatedly hiring temporary faculty?

After much deliberation, we have identified the following courses and areas of research that we believe would add immensely to the department’s strength and reputation:
Biochemistry (BIOL 380/381) An examination of the molecular basis of life is an essential offering in any Biology department. The Biochemistry course, along with the laboratory, has been a pillar of our curriculum for the past forty years, and is also a required element for the Biochemistry concentration. Fundamental in its scope, the course provides an in depth investigation of metabolic pathways and their regulation, as well as protein structure and function. We expect that our new hire will develop laboratory exercises that will be investigative in nature, and provide students with a state of the art exposure to modern biochemical techniques. As the college increasingly values the collaboration between departments, this faculty position is perfectly situated to strengthen our ties with the Chemistry department. The opportunities for teaching and research collaborations with the chemistry faculty are very exciting for both departments. Students wishing to explore the molecular aspects of biology will have an exciting opportunity to participate in the research laboratory of this faculty member.

Microbiology (BIOL 234/235) The uniqueness and diversity of the microbial world is fascinating for any student of biology, and the study of the metabolism, genetics, structure, and function of microorganisms leads to a richer appreciation of biological systems. Debby Walser-Kuntz had been teaching this course in alternate years. However, with the college switching to a five-course teaching load, and Debby’s commitment to teaching our Virology seminar, it became very difficult to fit this course into our curriculum. This comes at a time when there has been growing interest in the Microbiology course from students that are interested in pursuing allied health careers. (Microbiology and laboratory are needed to meet the admissions requirement for veterinary medicine, nursing, dental, optometry, and pharmacy). We have been offering the course by hiring temporary faculty, but this is not an ideal situation. Students deserve continuity as well as an opportunity to do research in this fascinating and essential field of biology. We are firmly convinced that a microbiologist fully integrated into the department would be far more beneficial than continuing with temporary appointments.

Bioinformatics/Genomics – Computational biology is an exciting and rapidly evolving field. The acquisition of huge data sets through genomics, proteomics, etc. is going to require that the next generation of scientists have computational and programing skills. Although some of these skills are integrated into our existing courses, we believe it is time to hire a faculty member specifically trained in the field of bioinformatics/genomics. We realize this is a broadly defined specialty, and we are excited to interview excellent candidates from a broad spectrum of research interests. We expect that an upper level course with a computer-based laboratory would be of great interest and utility to our students, and could cover topics ranging from comparative genomics to protein interactions and gene networks. The absence of this type of course is a clear deficiency in our department, especially when we compare our curriculum to other top liberal arts colleges (see list of courses and description from other Biology departments). A faculty member with training in this area would find collaborations with members of the Biology department, as well as cross-discipline collaborations with the Mathematics department.
Ecology (200-level course with labs) – The Biology department is proud of the historically strong interest among our students in ecology, with many alums going on to earn NSF graduate fellowships and eventual faculty positions at universities and colleges around the country. Mark McKone and Dan Hernandez are the two faculty members that teach in this area (compared to eight faculty that teach in the cell/molecular and organismal categories), and the ecology courses typically fill with long waitlists. After a careful review of the student enrollment pressures, we believe that our curriculum needs a 200-level transition course in ecology with lab sections that introduce students to current methodology and techniques. As mentioned previously, our majors would be better served with the necessary course background before tackling the 300-level courses and seminars. A 200-level exposure to ecology would serve as the portal for a variety of advanced options: Ecosystems Ecology, Population Ecology, ecology-focused seminars, and the 300-level Australia Ecology courses. Although Global Change Biology is a 200-level ecology course, and is a core requirement for the ENTS major, it does not include a lab experience and does not currently meet the requirement of the ecology/evolution category for the Biology major. The hiring of a faculty member with broad ecology training would open two options: 1) The offering of a new 200-level principles of ecology course, or 2) A reconfiguration of Global Change Biology to include laboratories and organized to meet the needs of both the Biology major and the ENTS major. This second option is particularly attractive as it allows us to replace faculty leaves internally (both Dan Hernandez and the new hire will be involved in the course), and it ensures the commitment to this critical course for both the Biology and ENTS departments.

Introductory Biology – Given the interest in studying biology by potential majors, pre-medical students, non-majors trying to fulfill their laboratory science requirement, and the genuinely curious, it is not surprising that the registration for our introductory courses are always strained. Both of the faculty members that we wish to replace taught in the BIOL 126 course, and their departures have/will put us in a dire situation. The first-year courses are not a good venue for temporary appointments. These are very challenging courses to teach, and experience is essential in controlling a large classroom with students of such diverse backgrounds. Having five faculty members that can teach in Bio126 will allow one faculty member to rotate out of this introductory course annually, allowing for flexibility to handle sabbatical leaves, college committee responsibilities, teaching an off-campus program, and increase the frequency of 300-level seminar offerings.

We strongly believe that hiring two faculty members to teach this slate of courses is essential if Carleton is to continue to support a premier undergraduate Biology program. We look forward to discussing this proposal with the external review committee and the administration, and we plan to submit a formal request later in the year. Although the areas of interest can be melded in a variety of ways, we believe that the following scenario best complements the existing courses and faculty interests in the department:

**Biochemist/Computational biology**
- Biochemistry + laboratories
- Bioinformatics/Genomics + lab
- Introductory Biology (Bio126)

**Microbial Ecologist**
- Microbiology + laboratories
- 200-level Ecology + laboratories
- Introductory Biology (Bio126)
#1 Williams College - Integrative Bioinformatics, Genomics, and Proteomics

In this capstone experience for the Genomics, Proteomics, and Bioinformatics program, we will take advantage of one well-studied system, the highly conserved Ras-related family of proteins, which play a central role in numerous fundamental processes within the cell. The course will integrate bioinformatics and molecular biology, using database searching, alignments and pattern matching, phylogenetics, and recombinant DNA techniques to reconstruct the evolution of gene families by focusing on the gene duplication events and gene rearrangements that have occurred over the course of eukaryotic speciation. By utilizing high throughput approaches to investigate genes involved in the MAPK signal transduction pathway in human colon cancer cell lines, students will uncover regulatory mechanisms that are aberrantly altered by siRNA knockdown of putative regulatory components. This functional genomic strategy will be coupled with independent projects using phosphorylation-state specific antisera to test our hypotheses. Proteomic analysis will introduce the students to de novo structural prediction and threading algorithms, as well as data-mining approaches and Bayesian modeling of protein network dynamics in single cells. Flow cytometry and mass spectrometry will be used to study networks of interacting proteins in colon tumor cells.

#2 Amherst College - Genome Biology

A study of the architecture and interactions of genetic systems. Advances in genomics are providing insights into a variety of important issues, from the structural limits of DNA-based inheritance to the discovery of novel infectious and genetic diseases. We will address how heritable information is organized in different groups of organisms. We will also cover a major challenge of this emerging field--the application of vast amounts of genetic data to understanding genomic integrity and regulation. We will critically assess the genome as a "cooperative assemblage of genetic elements" and conclude by discussing the consequences of genomic structure for shaping species traits and long-term evolutionary potential. Three hours of lecture per week.

#3 Swarthmore College - Genomics and Systems Biology

Fundamental questions in biology are being answered using revolutionary new technologies including genomics, proteomics, metabolomics, systems biology, modeling, and large scale protein and genetic interaction screens. These approaches have fundamentally changed how scientists investigate biological problems and allow us to ask questions about cells, organisms and evolution that were impossible to address even five years ago. Readings will include animal, plant, fungal, and bacterial literature. Laboratory projects will incorporate genomic and molecular approaches. One laboratory per week.

#4 Pomona College - Genomics and Bioinformatics with Laboratory

Introduction to prokaryotic and eukaryotic genomes, biological information systems and data analysis. Topics: comparative genomics, biological databases, sequence alignment, similarity searching, phylogenetic reconstruction, models of evolution, genome remodeling and molecular visualization. Laboratory incorporates computer-based exercises and student research projects. Prior computer experience is not required. Prerequisite: BIOL 41E or 41C (or 41M) or permission of instructor. Spring semester.
#5 Bowdoin - Biomathematics

A study of mathematical modeling in biology, with a focus on translating back and forth between biological questions and their mathematical representation. Biological questions are drawn from a broad range of topics, including disease, ecology, genetics, population dynamics, and neurobiology. Mathematical methods include discrete and continuous (ODE) models and simulation, box models, linearization, stability analysis, attractors, oscillations, limiting behavior, feedback, and multiple time-scales. Three hours of class meetings and 1.5 hours of computer laboratory sessions per week. Within the biology major, this course may count as the mathematics credit or as biology credit, but not both. Students are expected to have taken a year of high school or college biology prior to this course.

#6 Wellesley College - Proteomics with Laboratory

The sequencing of the genomes of many organisms has provided biologists with vast storehouses of information. However, it is important to remember that DNA sequences only provide a recipe for life. To a great extent the living condition arises from the complex interactions of thousands of cellular proteins. Research that focuses on the large-scale study of proteins is called proteomics. This course introduces students to the techniques utilized and the scientific questions being addressed in this newly emerging discipline. Student participation and the use of original literature will be emphasized. In the laboratory students will learn a variety of techniques utilized in the analysis of proteins. This will include column chromatography, two-dimensional gel electrophoresis, peptide mass fingerprinting using MALDI-TOF mass spectrometry, and confocal microscopy.

#9 Haverford College - Computational Genomics

Complete DNA sequence information is now available for hundreds of species. Computer-based comparisons of genes or genomes between different species are routine for many biological investigations. This course uses a lecture and workshop format to introduce students to the evolutionary and computational basis for such comparisons, as well as the statistical tools to evaluate these comparisons. Prerequisite: BIOL 301, some familiarity with statistics and probability and the instructor’s consent; BIOL 303 is recommended.

#10 Claremont McKenna - Genomics and Bioinformatics

Access to sequenced genomes and related bioinformatics tools have revolutionized how many biological investigations are approached. This course will cover genome sequencing, organization, and annotation as well as gene expression profiling, reverse genetics, gene networks, and predicting gene function. Students will be introduced to strategies and computational tools required for analysis of large-scale datasets.

#12 Davidson College - Introduction to Bioinformatics (Cross-listed as CSC 209) An interdisciplinary introduction to computer science and structured programming using the Python programming language in the context of biological datasets and applications, including algorithms for analyzing genomic data.

Genomics Students will utilize print and online resources to understand how genome-scale information (e.g., DNA sequences, genome variations, microarrays, proteomics, and clinical studies) can provide a systems biology perspective. Students will use computers, databases, and bioinformatics tools to analyze data and post their analyses online.