My first three years at Colgate University have been among the most challenging and rewarding of my professional career. I have enjoyed tremendously the opportunity to interact with outstanding students, learn from insightful, enthusiastic colleagues, and utilize the many resources available at Colgate to enhance my teaching and research capabilities. Before outlining my teaching, research, and service goals and accomplishments, I would like to briefly describe how I came to seek a faculty position at a small liberal arts college and how the environment at Colgate contributes to my professional goals . . .

My position at Colgate has provided the wonderful mix of teaching and research at a competitive liberal arts college that I have envisioned since I was an undergraduate. I have found the vast majority of Colgate students to be motivated, inquisitive, engaged, and willing to step beyond the memorization of facts to truly explore the subject matter that I find so fascinating. My colleagues at Colgate are highly motivated in the classroom and laboratory and provide the supportive environment that is necessary for a junior faculty member to thrive in both places. The University provides resources for teaching and support for research that I have not encountered in any of my previous positions. This investment in students by faculty and the University, and the willingness of students to invest themselves in their own education, have made my stay at Colgate a most enjoyable experience. I would like to take this opportunity to share my philosophies, goals, and accomplishments in teaching, research, and service at Colgate University.

Teaching Philosophy and Experience

As a teacher of biology, I am confronted with the task of providing students with both a depth of knowledge within the subject and the skills needed to independently examine additional areas of biological inquiry. The vast (and exponentially expanding) amount of information known about biological processes precludes providing a truly comprehensive description of any subject in biology. Thus, I approach my courses with two major instructional goals. One goal is to explain in a clear and understandable manner the concepts, vocabulary, techniques, and principles currently utilized by those that study the biological processes discussed in my courses. A second goal is to provide students with the information and the skills necessary to comprehend and critically evaluate new information and the ability to utilize their knowledge base and problem-solving skills in novel situations. In this section, I will briefly outline how I have made an effort to attain these two primary goals in my courses at Colgate.

Before students can begin insightful intellectual investigation of a particular academic field they must have an appreciation of what is known or currently understood to be true in that field. For a cellular or developmental biologist, this means beginning a course by addressing one of the following questions: What do we know about how cells function? Or, what do we understand about how organisms develop? Only when students have begun to answer these basic questions can they begin to ask the equally important question: What do we NOT know? Although biologists have a basic understanding of much of what goes on in cells and about how cells divide and interact to build an organism, we understand little about how these processes are carried out at the molecular level. Students must become familiar with the current state of knowledge in their discipline – concepts, terminology, paradigms – in order to truly understand the questions that remain to be
asked. Effectively providing this background information so that it can be utilized to ask new questions is an essential component of my teaching philosophy.

Since my courses provide the first exposure many students have to much of the information that we do know about molecular, cellular, and developmental processes, these classes tend to require the presentation of a significant amount of new information. In these information-intensive courses, I utilize a variety of formats to convey knowledge, including traditional lectures, technology-enhanced presentations, and interactive exercises. Some of my teaching is still done at the blackboard, where I use sketches to help students visualize the spatial organization of molecules and structures and the dynamic nature of their interactions in cells and organisms. Since much cellular activity is dependent upon complex structure/function relationships and intracellular movement, I frequently enhance my lectures with video clips (e.g. microscopy of whole cells and subcellular activity, time lapse photography of development) and computerized animations of cellular activities (several of which I have generated in collaboration with Colgate’s Center for Enhanced Learning) to clearly illustrate to students the three-dimensional organization and dynamic nature of intra- and extracellular events.

Whereas lectures in front of the class are one way of transmitting information, students in this situation are often merely passive recipients. I prefer to keep students actively engaged with the material and maintain a classroom environment in which student participation is instrumental (and expected!). This means encouraging inquiries and interruptions from students, pausing frequently to accommodate student questions and, less frequently, calling directly on students to answer questions that link material from recent lectures to that which is currently being covered. Each of these methods is performed in an effort to keep students engaged in the material, integrating seemingly unrelated topics with one another. Ultimately, my goal is to provide students with the information necessary to effectively communicate within the field and to ask new, intelligent questions about aspects of cellular or developmental biology that we do not cover in class or are not yet understood.

The second major part of my job as instructor is to help students understand how little we actually do know about biological systems and to push them toward identifying questions for which answers are lacking. Early in each semester, I take the time to introduce important investigative techniques used to obtain new information about cellular and developmental biology, and then continue to describe additional techniques throughout the course as appropriate topics are covered. As I introduce novel topics in cellular function or problems in developmental biology, I stimulate students to discuss how they would apply experimental techniques to ask specific questions about a particular biological process. In this way, students not only become aware of how our current understanding of molecular, cellular, and developmental biology was obtained, but they also develop an appreciation for how much knowledge we still lack regarding these processes.

In a further effort to help students think about how to ask new questions, I have written several “inquiry-driven” laboratory exercises in order to expose students to important techniques used to explore cell structure and function, and to stimulate students to utilize these techniques to ask original questions about cells and embryonic development. These exercises vary for each course, from FSEM to independent study, depending upon the background and lab experience of the participants. But, in each case, the goal is to make students think about questions that remain to be asked, how these questions can be addressed experimentally, and how experimental results are analyzed. I will briefly describe some of these exercises in the course descriptions provided below.
Equally important to designing and carrying out scientific experiments is being able to effectively communicate your results and to understand the results of others. All of my courses have a significant writing component and I require that students learn to read and critically evaluate the primary literature in the field being covered. This emphasis on communication not only exposes students to the mechanisms by which scientists communicate, but also helps students think much more carefully about what they are trying to express to their audience and how best to transmit that information. I believe the effectiveness of this emphasis on communication methods is revealed in the number of students who indicated on their SET forms that they not only learned a significant amount of new information, but that they also became better writers and were able to more effectively read and critically evaluate scientific literature.

I invest myself in the subject I am teaching and in my students, and I expect students to commit themselves to the course, as well. I expect a significant amount of effort from them, and they seem to respond well to that expectation. I also ask them to expect a significant commitment from me, and I am heartened by the way they take me up on that expectation by participating in class, coming into my office, and sending emails at all hours of the night. I look forward to continuing this high level of investment in the classroom and interaction with students in the future.

Research
I have greatly enjoyed revitalizing my research program at Colgate in an environment that retains an emphasis on undergraduate education while still maintaining high-quality research activities. I have especially enjoyed working in a department with faculty who share a common view of the importance of scholarship as a critical part of both faculty development and undergraduate education.

I have utilized this research environment to attain two equally important goals:
1) To continue my intellectual development and enhance my opportunity to contribute important new information to our understanding of cell structure and function. I have a fundamental desire to know the answers to important questions in cellular and molecular biology, and I have the opportunity to address those exciting questions in my research lab.
2) To provide a stimulating research experience for undergraduate students, immersing them in research projects that introduce them to the joys (and frustrations) of asking new questions.

Scholarship at Colgate
I am tremendously excited to now be at Colgate in an environment that provides the resources, infrastructure, and time necessary to maintain a competitive research program. I have also been pleased with the progress made in my research lab since my arrival at Colgate. In the three years since I arrived at Colgate, I have had two first-author research papers published in international, peer-reviewed journals; submitted one collaborative manuscript and have one first-author paper to be submitted for publication this fall; have written two research grants that were funded (by the National Institutes of Health and National Science Foundation); co-authored a third research grant that has been funded by NSF (pending final budgetary approval); and presented my research at four major international research conferences. I have also had 24 undergraduate students in my research lab, with 11 performing two or more semesters of work in the lab and eight carrying out projects through the summer. Seven of these students have presented their findings at national or international research conferences. I am excited about the new directions in which my research
program is headed and about the continuing incorporation of undergraduate students into the work in my lab. I will spend the next few pages briefly describing the work I have done at Colgate and my research plans for the future.

Current Research Focus

As mentioned earlier, my current research focus has returned to using yeast to investigate how molecules move in and out of the nucleus of a living cell. Since the nucleus and cytoplasm are separated from each other by nuclear membranes, some mechanism must exist by which large molecules can pass through the membranes to travel between these compartments. In order to facilitate this passage, the nuclear membranes are perforated by large channels, termed nuclear pore complexes, each of which consists of several hundred proteins. The only way a large molecule can move between the nucleus and cytoplasm is to travel through one of these nuclear pore complexes (Figure 1). Despite clear evidence that molecules must pass through nuclear pores during nuclear transport, we do not understand how this translocation through the pores takes place. The research performed in my lab investigates this translocation process and has given some new insights into the relationship between nuclear pore complex function and other important cellular activities.

Figure 1. A simplistic representation of nuclear transport in a eukaryotic cell. Arrows indicate movement of molecules between the nucleus and cytoplasm through the nuclear pore complexes. My work focuses on how this intracellular movement takes place.

Obtaining an understanding of how nuclear transport occurs is important for several reasons. First, efficient nuclear transport is absolutely necessary for a cell to remain alive. All proteins are manufactured in the cytoplasm of cells, but some of these proteins perform their essential functions in the nucleus. Thus, these proteins must be able to enter the nucleus to perform their required activity, and the only passageway into the nucleus is the nuclear pore complex. So nuclear transport is essential for cell viability. Second, understanding nuclear transport is also important for understanding differences between “normal” and “abnormal” cells, as the transport of specific proteins into the nucleus can result in the turning on or off of specific genes encoded by a cell’s DNA. Such a change in gene expression can change a cell’s activity, potentially making it divide more rapidly or adhere to nearby cells less tightly. Both uncontrolled cell division and loss of cell-cell adhesion are hallmarks of cancerous cells, and mutations in several proteins involved in nuclear transport have been shown to be associated with an increased risk of cancer. Gaining a better understanding of nuclear transport and the genes that are influenced by the transport of specific molecules provides important new insights into the function of normal and cancerous cells. Finally, many types of viruses that infect cells, including HIV and herpes virus, must get a portion of themselves into the nucleus in order to multiply. By understanding how molecules undergo nuclear transport, we may be able to better prevent specific molecules (such as viral particles) from entering the nucleus. Several pharmaceutical research groups are currently investigating the use of nuclear transport inhibitors as preventative treatments against viral infection.
Current Research Projects
My lab currently has four related, but independent projects examining nuclear transport. Each of these major projects can be divided into several sub-projects, and it is from these sub-projects that my undergraduate research students select the work they will be performing in my lab. The four major projects are briefly described below . . . .

All four of these projects have generated significant, publishable data since my arrival at Colgate. The data in our *Journal of Biological Chemistry* publication came from project (1), our contribution to the *Developmental Cell* submission came from project (3), and the manuscript we have prepared for submission to *Genetics* is from project (2). Most importantly, all four of these projects have led to interesting new avenues of research and will continue to produce exciting results well into the future.

Future Research Plans
The continuation of the projects briefly described above will generate significant new data about nuclear transport, provide outstanding research experiences for undergraduate researchers, and generate new hypotheses to be tested by further experimentation. It is with enthusiasm that I will retain the focus of a significant portion of my research program on these interesting projects. However, it is with equal enthusiasm that I will redirect some of my scholarship efforts into another, more intellectually exciting project. This project will use Systems Biology to examine how cells respond to stressful changes in intracellular conditions by changing the genes that they are expressing . . . .

Summary of Research
I am excited by the opportunities for research offered at Colgate and am encouraged by the progress made in my research program in the three years since my arrival on campus. I look forward to continuing to maintain a research lab that is driven largely by the efforts of enthusiastic, committed undergraduate research students and to interacting closely with these students to enhance their research experience and intellectual development.

Service
As mentioned in my introduction, much of my motivation for obtaining a faculty position at a liberal arts institution was so that I would have the opportunity to work closely with students, interacting not only in the classroom or in the laboratory, but also in venues outside of a formal educational setting. Consistent with my desire to interact with and influence undergraduate students, many of my service activities are directly related to the undergraduate experience. I have also made an effort to be a significant contributor to the Biology Department and believe I have made an impact within my division and the Colgate community as a whole. Provided below is a comprehensive accounting of my service activities at Colgate . . . .