

CELL AND MOLECULAR
BIOLOGY

Program Handbook

2004-2005

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PREFACE

Welcome to the Cell and Molecular Biology Program. The Program is one of the largest graduate programs at the University of Vermont with more than 40 students and 50 faculty from more than 15 different departments. This handbook is divided into sections to provide information about living in Burlington, resources available at the University of Vermont, and details of the CMB Program. Specific questions about the CMB Program can be directed to:

Erin Paveglio
Administrative Assistant
C242 Given Building
656-9673
erin.paveglio@uvm.edu

Dr. Christopher Berger
Director
118 HSRF
656-0832
cberger@uvm.edu

Additional information about the University of Vermont is available on-line at www.uvm.edu, or from the Graduate College:

332 Waterman Building
656-3160
www.uvm.edu/~gradcoll/

or from the Registrar's Office:

360 Waterman Building
656-2045
www.uvm.edu/~rgweb/

The faculty and students of the CMB Program are also valuable resources. A current list of all CMB Program members, including contact information, can be found in the Appendix of this handbook.

THE GRADUATE SCHOOL EXPERIENCE IN CELL & MOLECULAR BIOLOGY

(Adapted and modified from a document found on the LSUHSC website, authored by Iris Lindberg, 2002)

As a graduate student, you are entering into an apprenticeship designed to help you develop into a professional cell and molecular biologist. The skills required to achieve this goal are acquired through participation in both formal and informal scholarly and research activities, all of which are important components of your training program. An obvious requirement is a thorough knowledge of the basic principles of cell and molecular biology and command of your area of specialization. The foundations of this will be laid in your required course work, seminar experiences, and participation in journal clubs, etc. However, true expertise in Cell and Molecular Biology is only attained by the actual **practice of science through the performance of specific projects**. The projects themselves are important but for you they are less important than the experience of handling them. Infinite projects – those that are extremely labor-intensive and technically impossible unless a miracle takes place are not well-suited for thesis projects. You may or should have several types of projects running concurrently. One kind will most likely be a bread-and-butter type of project guaranteed to result in a thesis chapter (but perhaps with less than earthshaking results). Another may be a collaborative effort with another person in the lab who has primary responsibility for the project. A third kind will often be a succession of short “what-if” types of experiments, most of which will fail, but one or more of which will succeed and turn into a real project. These are called high-risk / high-reward types of projects - and here the trick is to know when to pull the plug.

Through execution of these three very different types of projects, you should come away from the experience with the following set of skills:

KNOW HOW TO CARRY OUT AN EXPERIMENT

1.) You will be able to independently **design an experiment**. This includes going to the literature to find a method and adapting it to your needs. While you will at first discuss all experimental design with your mentor, by the end of your graduate tenure you will independently design all of your experiments. Your experiments will likely start with the results of others, but then you will take the project to the next stage or test a new hypothesis.

Designing an experiment also includes knowing what **positive controls and negative controls** are necessary to include. You will also know **how many replicates**, cell lines to use, number of experiments or subjects to employ, based upon previous results of yours and of others in the field. This is called a power analysis.

Lastly you will know how to **record the design** of the experiment in a manner that will be clear to you later when you try to write methods up, and to others when they go through your notebook.

2.) You will be able to independently **execute an experiment**. This is where the concept of “good hands” applies. People with good hands know what steps must be executed painstakingly and when, or if, steps short cuts can be taken. There are two elements here -

experience in general laboratory techniques and good common sense. Only the first can be taught. People who do not have the second may not excel in bench research; but be aware that there are many other important branches of science where “good hands” are not as important.

Execution of an experiment also includes **knowing when to ask for more help.** There is nothing worse than losing your valuable time. Your PI and your colleagues in the lab will generally always be happy to answer your questions, provided they are there when you need to ask them - i.e. plan daytime execution of new experiments! You are also encouraged to develop an ever-growing network of friends with different expertise that you will draw upon for the rest of your scientific career.

Lastly, you will have **learned to think about the output style at the beginning,** for example, loading a gel so it is very easy to interpret the results in a published photo. (All experiments should be carried out as if they were for publication. They may be!) You will know that all information pertaining to the experiment should be recorded, no matter how small a detail.

3.) You will learn how to independently **analyze the results** of your experiments. This includes knowing how to use the software and what its limits and advantages are; and knowing when you really need statistical analysis, and how to use it. You will know how to present the experiment in a manner that best shows the result that you think is most important - without exaggerating its significance.

Indeed, you will **never over-interpret your data.** Instead, you will be your own worst critic. Only you are on the front lines of an experiment; so, only you can see how you could have gotten your results from an artifact rather than through the application of your experimental variable. You will know when and how to spot these possibilities and to redesign subsequent experiments to be able to address these potential problems.

You will be able to present your results in light of what others have found, will know immediately when they conflict and you will come up with possible reasons for the conflict. You will **know the literature** better than anyone except perhaps your competitors.

4.) **Your lab notebook** will record the progress and findings of your experiment in clear, succinct statements. It will not be a random collection of data, but **will emphasize the presentation of the hypothesis and the results** in a manner accessible to a total stranger in ten years (and this has indeed happened!)

5.) You will have a **repertoire of basic biochemical techniques;** but further, you will understand **basic principles of scientific experimentation** applicable to your present and hopefully future projects; some examples are: making sure the unknowns fall in the middle of the standard curve; treating the sample and standards identically; knowing how to label your samples/films during use and storage for minimal possibility of a mix-up. You will date everything that you do. In general, you will know how to go about your experiments in the most efficient and expedient way.

6.) You will know how to **use all standard laboratory equipment**, and you will be able to figure out how to use a piece of equipment new to you. If it is complex, you will always first get the information that can guide you (either from the manual, the company, or the web) rather than risk damage. You will constantly assess when a piece of equipment is performing optimally and either optimize it yourself or arrange to have it fixed by others if sub-optimal performance is detected. You will learn to clean up after yourself and leave the equipment in good working order for the next person.

7.) You will know how to **organize your time efficiently**. This means that while something is incubating, you will be labeling tubes or designing primers or reading the literature for a paper you are planning. You will use weekends to speed overnight steps (starting cultures, etc), if not to carry out actual experiments. You will have learned to run multiple projects running concurrently by using an organized (and ambitious!) list of all tasks/experiments to be carried out that for all projects. Efficient use of time will most likely save you up to a year in your graduate studies.

8.) You will be **expert in independently locating information**. This will include protein and nucleotide databases; journal sources; web sources; technical information from companies; the extensive collection of books and manuals in the laboratory; and your network of friends and colleagues.

KNOW HOW TO HANDLE A PROJECT

1.) After you complete an experiment, as a senior graduate student you will immediately see what experiments naturally come next. (Generally, you will either need to repeat the experiment to confirm; to refine your hypothesis in a new experiment; to change gears and test an altered hypothesis; or to pull the plug on the line of research altogether.) You may often need to use a different line of experimentation to confirm your hypothesis another way, which will greatly support your idea. You may need to spend time with your results and the literature to see whether your line of work is profitable. If it is, then you will be able to plan out a series of experiments that center around your hypothesis that will eventually form the nucleus of a published paper.

2.) If you are unable to uphold your hypothesis through different lines of experimentation, or if you cannot consistently get a result that upholds your hypothesis by repeating an experiment, then you will know that it is time to pull the plug on the hypothesis and you will do it quickly and without regret for the time you spent. On the other hand (rarely) the question is so important that this is the time to develop a new method to answer the question, which will require considerable additional effort. You will know how to tell the difference between these two scenarios, i.e. **perform continuous cost-benefit analyses**. Initially, it will be your advisor that tells you when to quit; later, you will (and must) make these decisions yourself.

3.) Do not underestimate the value of luck and serendipity. As we all know some people seem to have all the luck and their experiments all turn out and their papers turn up in Nature and Science. Part of this “luck” is an illusion because they don’t talk about all the failures. Indeed one of the most important things to learn now is how to deal with failure. Failed experiments or projects can often be saved into important, published findings if handled correctly. Luck can

also be improved by two things: skilled laboratory techniques and study design (think about optimizing your luck at black jack). Remember to look for the unexpected as serendipity often fuels successful research endeavors. As Pasteur observed, "In science, chance favors the prepared mind."

4.) Eventually you will **develop your own project ideas** yourself (in the last year of graduate school). Because you are a student you will need to pass them by your advisor for approval, but in your last years, you should be more knowledgeable and more proficient than he/she is in your area of research, and should be able to come up with good new ideas for projects (If you can do this you will never worry about someone "borrowing" your ideas!). Your ideas will represent not just what is possible to do, but also what is important to do; you should not be afraid to tackle the most important questions in your field.

KNOW HOW TO WRITE AND EVALUATE A PAPER

1.) You will know **how to format a paper** so that it contains:

- a.) an outline that summarizes the major findings in the broad context of the work.
- b.) an introduction that orients the reader as to why the work is important.
- c.) a methods section that enables the reader to actually repeat the experiments.
- d.) a results section that succinctly describes each major finding, and groups them appropriately in figures. Every statement in the results will be supported incontrovertibly by the data in the paper.
- e.) a discussion that does not repeat the results but rather takes each major finding presented in the results and discusses it in the context of how it relates to previous and future work, with comprehensive and appropriate literature citation.
- f.) figures that are easy to read and logically presented, and can be reduced severely without loss of legibility.
- g.) absolutely no mistakes of any kind-either typos, omissions, inconsistencies in the data, redundancies, or errors in referencing.

2.) You will be able to write a **rebuttal letter** to the journal editor that explains how you have responded to each point in the review.

3.) You will be able to **critique your own papers**, those of other lab members, and those of others in the field. Your critiques will essentially reflect the standards that you would expect of your own work.

KNOW HOW TO GIVE A GOOD TALK AND POSTER

1.) You will be able to present a talk for your lab group that summarizes your recent work. This will involve:

- a.) presenting a hypothesis that you are trying to confirm or refute;
- b.) discussing the methods you used;
- c.) presenting the graphed data; and
- d.) interpreting the data in terms of your hypothesis.

You will then discuss how your results fit into the literature, and present your ideas for future experimentation, either along this line of research, or whatever else you plan to do.

2.) Through yearly involvement in the **CMB seminar series** you will be able to present a 50-minute seminar to a group outside your field. This will generally follow the same format as above, but will include a much larger introductory segment so that the group can understand why your work is important. You will have learned how to make your talk interesting (posing questions and answering them; presenting a limited amount of information). You will know how to design slides and use (not abuse) PowerPoint.

3.) You will be able to present your findings in poster format. Poster presentations teach you how to present a poster that is nicely formatted and easy to follow. It is not unusual for this poster text to evolve into the actual nucleus of the subsequent paper.

KNOW HOW TO WRITE A GRANT

You will have acquired experience in **presenting your ideas** through the following exercises:

1.) You will have seen at least four years' worth of your advisor's grants as examples; you may or may not have attended a seminar on grant writing.

2.) You will have **written grant proposals for your qualifying and preliminary exams** that are essentially NIH-format proposals lacking the budget items and preliminary data.

BE ABLE TO WORK WITH OTHERS

1.) Through four to five years interacting with others you will have learned how to be a **good laboratory citizen**. You will spontaneously contribute your effort to clean up general lab areas or to make commonly used stocks. You will respect the work of others by replacing all reagents you finish and not sequestering any reagents or common equipment in your area. The use of equipment will follow similar guidelines.

2.) You may gain **experience as a supervisor** in directing undergraduate students. Our laboratories often have at least one undergraduate "helper" in the lab; upon occasion, these students may perform actual experiments under your direction. You will need to learn how to teach these students beginning laboratory procedures, and how to handle people in general so they perform well and are not discontent.

3.) You will know how to **work in a research team** as a primary member (i.e. the first author position) and as a secondary member (i.e. contributing work for a paper ultimately first-authored by others). Upon occasion this will require going through a departed lab member's lab notebook, which is when you will learn how important it is to be totally clear in your record-keeping. This also often happens via collaborations with other laboratories, i.e. when one laboratory contributes data to a study originated by another. In addition to supplying data, you are then asked for the methods, data interpretation, and appropriate literature citations for use in papers; all must be accurate.

DEVELOP GOOD ETHICAL PRACTICES

You **will always use original – this means your own language** in any written work that you submit for publication or for your courses. You will repeat experiments until you know that even when judged by the harshest criteria, the findings will be reproducible, and the conclusions will be valid. You will prefer to develop original lines of research rather than directly copying those that you know that others are already engaged in. You will review the work of colleagues without bias, and will voluntarily eliminate yourself as a reviewer if you are in direct competition. Your treatment of animals will always be humane. You will handle radioactivity and toxic materials in a responsible manner, both for your own health and for that of your colleagues.

When you know all of the above – congratulations, YOU ARE A POST-DOC!

YOU AND UVM

BEFORE YOU ARRIVE (HOUSING OPTIONS)

There is a wide range of housing available to graduate students in and around Burlington. There are urban (if any of Vermont can be considered "urban" it is Burlington) and rural settings. Basically, whatever your needs, they can be met in or near Burlington.

If you do not have a car you will probably want to live close to downtown. Burlington is easily traveled by foot. Downtown Burlington offers most of the things you need; grocery stores, shopping malls, cinemas, theaters, bars and nightlife. All this (and Ben and Jerry's Ice Cream!) can be found just a few minutes from UVM. Downtown Burlington, however, tends to be a pay-more-for-less proposition. Because Burlington is a "college town" where UVM is just one of 4 four-year colleges and community colleges in the local area, there is a competitive market for student housing. You can expect to pay, on average, \$650 for a studio or a one bedroom apartment, two bedrooms range between \$800 and \$1200, and three bedrooms are approximately \$1200 to \$1500. These rentals do not often include heat, hot water or any other utilities and do not have laundry.

If you don't mind commuting a few minutes, the prices tend to drop off just a few miles out of town. Colchester, Essex Junction, Williston, South Burlington and Winooski are home to many UVM graduate students. This is usually the option students with partners choose because you can get a small apartment for a better price outside of town.

Within Burlington the housing market is largely driven by undergraduate renters, and thus the best time to hunt for housing is at the beginning (late-May) and end (mid-August) of the summer. It is hard to find leases that do not begin at these times. Don't be surprised if you hunt for housing in late May, for it to be a summer sublet. Starting dates tend to be more flexible outside of Burlington where the housing market is less dependent on undergraduate students. Either way, most places will require you to rent for a full year.

If you don't mind living with roommates/housemates, there are many "room available" signs posted on campus that you could use as a starting point. These types of living situations are also advertised in the local newspaper, the Burlington Free Press (<http://www.burlingtonfreepress.com>). This paper is also your best bet if you are more interested in a small apartment. Two other great apartment sources are the Seven Days newspaper (<http://www.sevendays.vt.com>) and <http://www.burlingtonapartments.net>.

Some graduate student housing is available through UVM. The Cottages on the Trinity Campus are community living with 5-7 people. Student housing is also available at Fort Ethan Allen. Although the Fort is located on a bus line, times are restricting; a vehicle may be needed for this residence. Please note, there is a substantial waiting list for this housing. You may want to put your name the list immediately as it is quite affordable housing. For more information about university-sponsored housing you should contact either Residential Life at Debbie Crosby (debbie.crosby@uvm.edu) (802) 656-9398 or Fort Ethan Allen Housing at (802) 654-1735. In addition, Centennial Court Apartments are rented exclusively to UVM associates, although the wait for these apartments is usually lengthy. Centennial Court

Apartments offices can be reached at (802) 863-1855. You can also contact the Student Affairs office in the College of Medicine at 802-656-2150 for a list of housing.

WHEN YOU ARRIVE

Getting Settled

Okay, you've made it to Burlington. What's next? There are several responsibilities which you will need to take care of in the next few days. These are: 1) see Erin Paveglio about funding (C242 Given Bldg.) 2) obtain a parking pass from Parking and Transportation Services 3) activate your email account 4) get your student ID at the CatCard office in the building with the bookstore and 5) register for courses.

Funding

In order to activate your first-year funding you must see Erin Paveglio, who can be found in Given C242. Student health insurance is included in your first-year teaching fellowship. Comprehensive student fees, approximately \$500/year for a full-time graduate student, are the responsibility of the graduate student and must be paid before you are allowed to register. Graduate students are eligible for student loans which require you to complete the FAFSA form and complete an entrance interview at the financial aid office. For more information, log on to

<http://www.uvm.edu/financialaid/>.

The complete financial aid handbook can be downloaded from

<http://www.uvm.edu/financialaid/?Page=handbook.html>.

Parking

Graduate student parking permits for 2004-2005 are valid until June 30th and cost \$150. They can be obtained from the Department of Transportation and Parking Services located at 622 Main Street. Their campus phone is 656-8686 and their office hours are 7:30 a.m. - 4:00 p.m. In addition, information including campus parking maps can be found at <http://www.uvm.edu/tps>.

Email and the CMB Website

Every student is given an email account. Activate your new account at <https://www.uvm.edu/account/> after August 1.

In the fall of 2004, the Cell and Molecular Biology Program received a new website. This site is mostly database driven, meaning the personal information is entered by each person. It is your responsibility to keep this information updated. First time users will receive an email at your UVM account regarding login access. Each page has a space for a picture. It is highly recommended that you have your photo taken at MedPhoto (656-2254) as soon as possible. We prefer the photo to be taken in a lab setting. Any questions regarding this can be directed to Erin Paveglio at 656-9673.

Student ID

These ID's entitle a student to use the gym facilities, for library privileges and to have payroll check cashing privileges. For these purposes, your ID will already be activated. However, if you choose a lab in HSRF or the Given Building, your ID will be your key to enter the building after hours and on weekends and your ID will not already be activated. If necessary, activate your ID for access to these buildings by contacting the administrative assistant for your lab.

Course Registration

Registration for courses can be done when your initial paper work is completed with the Program Administrator, Erin Paveglio. Subsequent year course registration can be completed after consultation with your chosen advisor. Advising is a crucial element of graduate program planning, and it is important that you consult your Advisor to outline your course of study. Once you have decided upon a plan of study, you may enroll for the appropriate courses on the web, at <http://www.uvm.edu/registrar/>. To login, use your social security or student ID number as your User ID and either your birth date or the last six digits of your social security number as your PIN. Instructions can be found on the website or through Graduate Admissions, or the Registrar's Office.

MISCELLANEOUS

Bookstore

Although you may want to check out the bookstore, don't expect to be able to browse at your leisure. During the first few days of classes, undergraduates pack the campus store for books and other materials. The bookstore is located near the Royal Tyler Theater and the Bailey-Howe Library.

Student Associations

Graduate Student Advisory Council (GSAC)

The Graduate Student Advisory Council (GSAC) is comprised of one student from each graduate program. Currently, the GSAC is responsible for administering mini travel grants, negotiating the graduate student health insurance policy and sending representatives to participate in a variety of university panels and committees. Future goals include having a larger voice in its current roles as well as expanding the GSAC's scope to dealing with numerous additional aspects of graduate student life. These include stipends, university resources, tuition, and information dissemination. CMB students are encouraged to discuss any concerns and/or questions relating to their graduate student lives with the CMB representative so that their concerns may be heard by the GSAC and their questions answered. Several GSAC meetings are also open to all graduate students and participation by non-GSAC members is welcomed. Finally, proceedings of the GSAC are reported in "The Graduate Student Newsletter".

Association for Women in Science- Lake Champlain Chapter (AWIS-LCC)

The College of Medicine, in cooperation with the Lake Champlain Chapter of the Association for Women in Science (AWIS-LCC), offers informal mentoring of female graduate students by female faculty in the College of Medicine. Women in the Cell and Molecular Biology Program are welcome to participate in this mentoring program. Further information is available from the Graduate Education Committee of the College of Medicine, from AWIS-LCC, or the Cell and Molecular Biology Program office.

Health Services

Insurance

Graduate student health insurance coverage is provided to all CMB students. The first year will be covered by the University and subsequent years are covered by your advisor. If your spouse has better health insurance, you can waive your decision for UVM health insurance and avoid using the Student Health Center. For more information on health coverage, visit this website: <http://www.uvm.edu/~dosa/chw/insurance/>. Health Insurance questions should be directed to Mary Lou Monty from the Student Health Center 656-0602.

Health Center

The Student Health Center is available to students throughout the year. There is an additional fee for use of the Student Health Center during spring and fall semesters and is automatically added onto your semester bill. This fee covers unlimited visits to the Health Center, but does not include any additional laboratory fees. Any questions regarding the Student Health Center or this fee can be answered by calling the Student Health Center at 6-3550. In addition to the student health center, there is also a women's health center, counseling center and nutrition services. All of these are available after the health fee is paid to UVM students with UVM health insurance. To check out the services provided by the Center for Health and Wellbeing go to the following website:

<http://www.uvm.edu/health/?Page=services.html>.

Transportation

Several nearby communities are accessible using the Chittenden County Transit Authority (CCTA) bus system. Students with a valid UVM ID ride CCTA for free, provided the ID is present at the time of boarding. For more information of routes and schedules, log on to <http://www.cctaride.org> or call (802)864-2282.

Burlington International Airport

Burlington is serviced by Continental Airlines, Delta Airlines, JetBlue, United Airlines, and USAir. The airport is approximately a 10 minute ride from UVM and is located at 1200 Airport Drive, South Burlington.

Bus Service

The bus terminal is located at 345 Pine Street and their phone number is (802)864-6811. Vermont Transit (<http://www.vermonttransit.com>) services Burlington, with connections to Greyhound. The station is about a 10 minute drive from campus

Train Service

Amtrak (<http://www.amtrak.com>) runs the Vermonter line which runs between St. Albans, VT and Washington, DC via New York City, and stops in Essex Junction, Vermont. The location of the train station is 29 Railroad Avenue.

Dining and Entertainment

There are several good locations on campus to grab a bite to eat. The Atrium in Given and the cafeteria in Billings serve warm meals and offers a variety of items on the salad bar. The Cyber Café, in Bailey-Howe Library, offers Speeder and Earl's coffee, and pastries. The Underground in the pedestrian underpass (under Main Street) is home of the 'best subs on campus'. If you want a quick salad and soup or a sandwich, check out Alice's Café in the Living and Learning Center near Cook Science Building. Get waited on at the Waterman Manor or help your self to the delightful daily buffet or salad bar. If you don't have the time, just head to the Waterman Café in the basement, which has a salads and pizza to go. Hours for all locations are limited in the summer and during breaks. Further information on campus eateries can be found at <http://uds.uvm.edu>.

In addition, several local vendors serve lunch items like burgers, French Fries, wraps and Chinese out of trucks parked along the campus green on University Place.

Despite Burlington's small size, the city and surrounding towns are culturally vibrant with art houses, live music and a variety of dining options. In the summer, the Lake Champlain waterfront is host to music festivals, a microbrew festival, and a specialty food festival while Church Street hosts Jazz Fest, Latin Fest and Mozart Festival. The outdoorsman can hike or mountain bike on the numerous trails through the Green Mountains, sail or swim in Lake Champlain and in the winter, ski on the northeast's best mountains. The food guru can dine at a myriad of restaurants that range from Japanese to Mexican to Thai or Italian.

For those craving a more urban environment, Montreal is only a couple hours drive away and Boston is a four hour drive.

One can almost never be bored in Burlington!

For more information about Burlington, visit the City of Burlington's home page: <http://www.ci.burlington.vt.us/>

FELLOWSHIPS AND FINANCIAL AID

First Year Students *generally* are supported by Graduate Assistants (see below). A few first year students are supported by Teaching Assistantships or Research Assistantships from departments, individual research grants to faculty, or training grant fellowships - all applied for by potential advisors or sponsoring departments. By the end of the first academic year the student should identify an advisor, who takes responsibility for future support for the student. Therefore, first year students supported by Program Assistants should speak to potential advisors about the nature and duration of support, as well as about research.

First Year Graduate Teaching Assistants are appointed by the Dean of the Graduate College on recommendation of the Program. These are for 12 months in duration and include one semester of teaching duties. A Teaching Assistant is expected to handle the responsibilities connected with a maximum of 10 contact hours in the course or courses to which he/she is assigned. Those assigned to elementary courses normally teach two laboratory sections per week, attend prep sessions and lectures, and help proctor and grade examinations. Generally, tuition for 10 course or research credits per semester is waived with the assistants.

Teaching Assistants should expect to receive help in their teaching techniques from the faculty member in charge of their laboratory sections. In addition, their faculty supervisors will prepare an evaluation of teaching performance. Summaries of these evaluations will be maintained in the graduate student's file and are available for inspection by the Teaching Assistants.

Visit the Center for Teaching and Learning for more teaching resources and techniques. The Center offers workshops and retreats to perfect your teaching skills. <http://www.uvm.edu/~ctl/>

Teaching Introductory Biology

Most Teaching Assistants are assigned to Bio 1 or 2 and have desk space in Marsh Life Science Building, where the Biology classrooms and Biology Department Office (120 Marsh Life Science Building) are located. The Biology Office Staff are there to support the Staff and Faculty teaching Bio 1 and 2 (among other courses), including Teaching Fellows. Gary Olivetti is the person to contact regarding TA responsibilities. Building access and keys to laboratories will be issued to Research and Teaching Assistants from Michael Yun (myun@uvm.edu). Be certain you do not use your key to admit someone who is not entitled to have one. Lock your laboratories, classrooms, teaching laboratories, and offices and close all windows before you leave the building. When using common rooms, be sure to lock them after you finish. It is your responsibility to return your key when you leave the University or if you have no further need for it.

Supplies for Teaching

The Biology Stockroom is located in Room 009 of the Marsh Life Science Building and is open during regular hours as posted. Stockroom purchases should only be made with the knowledge and approval of your teaching supervisor. Under no circumstances should material be borrowed from another laboratory without the permission of the person in charge.

Graduate Research Assistants are supported by specific faculty research grants. The particular responsibilities and terms of appointment vary with the requirements of each grant proposal. Appointments may be for a calendar year period, a semester, or a summer period. Generally, salaries from research grants are larger because students must pay tuition; it is not waived.

Fellowship Grants students are encouraged to compete for national graduate fellowships, such as those made available by the National Science Foundation, the Smithsonian Institution, and the Grass Foundation. Information on these fellowships is available from the office of the Graduate College and the Office of Sponsored Programs.

Other Sources of support, particularly for more *senior* students come from varied sources including departmental Teaching Assistantships, Research Assistantships from advisors' grants, and training grants. It is important to understand the amount of stipend, duration, and possible waiver of tuition. Your advisor or home Department business manager can help you.

Summer Taxes

Federal taxes will be deducted from your paycheck all year. FICA and Medicare is withdrawn from your paycheck during the summer months. If you are registered as a full-time summer student (6 or more credits), then you will be eligible for a refund this money. So it is very important to register for summer research credits. Summer research credits count towards a student's total number of credits for the upcoming academic year, so students with tuition waivers associated with their Research or Teaching Fellowships should remember not to exceed the maximum number of credits (20) in an academic year that are covered by the tuition waiver.

Graduate Student Research Expenses

The needs for supplies or equipment to perform graduate student research projects vary with the particular thesis problem chosen. The University of Vermont can provide only limited direct financial support for these projects. Funds for your thesis project are usually obtained from your advisor's research grants.

Faculty members are encouraged to apply for institutional grants, federal, state and private grants and contracts to support graduate students and their research. Likewise, graduate students are urged to apply for grant funds such as Graduate College Mini-Grants, NSF-Doctoral Dissertation grants, Sigma XI-RESA research awards, and the special funds from the Smithsonian Institution and the American Museum of Natural History. The Office of Sponsored Programs in the Waterman Building is ready to assist graduate students in locating appropriate funding sources. The Graduate College Mini-Grants are for research expenses as well as travel to scientific meetings and require matching funds from your advisor or Program.

The Program will send out notices when it has matching funds available for the Mini-Grants, which are generally submitted for fall or spring deadlines.

DEGREE PROGRAM

The Cell and Molecular Biology Program offers programs leading to the degrees of Doctor of Philosophy and Master of Science.

REQUIREMENTS FOR M.S. AND PH.D. PROGRAMS

Acceptance into the Program

Applications to these programs are reviewed by the Steering Committee with respect to grade point average, graduate record examination scores, and letters of recommendation. Generally an on-campus interview is also required. If the Committee approves the application, it is evaluated for financial support from the Program.

Admission to Candidacy

All M.S. and Ph.D. students are admitted to the Graduate College but are not concurrently admitted to candidacy for the degree. Admission to candidacy occurs only after deficiencies in course prerequisites and residence requirements are completed. Upon successful completion of the Proposal Examination as approved by your Studies Committee, the Comprehensive exam, and completion of all prerequisites for admission the student will be advanced to candidacy for the doctoral degree. It is the responsibility of the Studies Committee to notify the CMB Program in writing of the completion of the Comprehensive exam and Proposal Examination and the resultant change in status. After Studies Committee approval, the advisor should notify the Graduate College and the Department as these requirements are fulfilled.

Maintenance of Good Standing

The Seminar/Student Progress Committee annually reviews the files of each graduate student to determine whether progress is being made toward completion of requirements. At the end of each academic year, the Committee will notify students of uncorrected deficiencies. All students in the program are required to show satisfactory progress, which is defined as:

- ✓ Finishing the *minimal* course work in three years.
(The Studies Committee may require additional courses.)
- ✓ Completing the Proposal and Comprehensive Exams within the prescribed time limits.
- ✓ Regular Participation in the Student Seminar Series.
- ✓ Maintaining a 3.0 G.P.A.

Full Time Status

Two circumstances allow for a student to be considered full time: 1) if they are funded and registered for 6 credits or 2) not funded and are registered for 9 credits. During the summer, students must be enrolled for 6 credits to be considered full time and avoid FICA withdrawals.

Guidelines for Rotations

The purposes of rotations are three-fold: (1) to become acquainted with a potential advisor, his/her laboratory and research directions; (2) to gain experience in a variety of techniques, and (3) for advisors to evaluate potential graduate students in their laboratories. Do not expect to accomplish a full project in this time, but do expect to do enough work (10 - 20

hr/week) so that you can get a good feel for what it will be like to pursue your thesis research in that laboratory and the advisor can decide if she/he wants you in her/his laboratory.

Incoming CMB Students are expected to

- Do a minimum of 3 rotations
- Have a minimum of 2 different rotation advisors
- Stay in each rotation a minimum of 8 weeks (to count as full rotation)

Let the science be your primary guide to a choice of potential advisors and rotations. Be sure to talk with potential advisors about what each of you is expecting from a rotation, and remember to speak to potential advisors about the nature and duration of support after your first year, as well as about research.

Suggested start and end dates for 2004/2005 are as follows

1 st Rotation	September 27 th , 2004– November 19 th , 2004
2 nd Rotation	January 10 th , 2005 – March 4 th , 2005
3 rd Rotation	March 21 st , 2005 – May 13 th , 2005

These are guidelines to provide some structure and points of reference for setting up rotations. While the guidelines are to be followed, they contain a practical degree of flexibility if and when needed. Also, exigent circumstances or requests for large deviations from the guidelines may be accommodated if brought to either the Program Director or the Education Committee.

Teaching Fellows must make their teaching schedule and its demands on their time clear to the advisor.

Credits And Grades Of Rotations

First year students doing rotations should register for CLBI 295 (Special Topics: Laboratory Rotations - 3 credits) in the Spring semester. Students will be expected to write a short paper on each of their rotations in manuscript form (i.e. containing an introduction, methods, results, discussion, and references) describing at least one set of experiments done during the rotation. Even if the experiments done during the rotation don't produce the expected or desired result, the discussion of the paper can focus on potential reasons for the observed outcome (or lack of an outcome) and the next experimental steps that might be taken. Each rotation report should be evaluated by the rotation advisor and turned into the CMB Program Office (C242 Given) before the start of the next rotation. The rotation reports, along with a written evaluation from each rotation advisor, will form the basis for the grade assigned in CLBI 295 for the rotations.

Finding an Advisor

First year students will be assigned a Faculty mentor before arrival to act as an advisor for the first year. Early in the fall semester you can meet students and faculty at the annual Retreat where you will view posters of individual researcher's work and meet with them in a cordial setting. In addition, you can find more information on faculty members on the CMB Program web page www.uvm.edu/cmb. An advisor should be selected by the end of Spring Semester

of the first year. After an advisor is chosen, change of research advisor requires the Director's approval.

Studies Committee

By the end of the first year, the advisor will recommend a Studies Committee to the Director, who then transmits the names to the Graduate College. It is the responsibility of the Committee to supervise the student's program (which must also have the approval of the Director and the Dean of the Graduate College), to review her/his progress regularly, and thus to determine whether she/he should be retained in the program. The Committee must meet as a group with the student annually to review the progress of the student. Meeting immediately after the student's annual seminar is routine.

Residence Requirement and Transfer Credit

The Program abides by the minimum residence requirements of the Graduate College, which call for 21 hours of graduate credit for the M.S. degree and 51 hours for the Ph.D. degree to be taken at the University of Vermont. In both cases, a minimum of 15 *graded* credits must be taken in residence at the University of Vermont to be used in the compilation of the student's graduate G.P.A. The Comprehensive Exam and Thesis Proposal Grant must both be completed while in residence at the University of Vermont.

A limited number of graduate course credits acquired elsewhere, at UVM prior to admission to a graduate program, or by credit by examination may be included as part of a student's program of study, with approval of the program faculty and the Dean of the Graduate College. Credit by examination is earned by arranging through a program faculty member to take an examination that tests the student's skills and knowledge in a particular UVM course appropriate for inclusion in the student's degree program. If credit is transferred, only the credit is transferred, not the grade. Graduate Credit earned at UVM after completion of the bachelor's degree but prior to admission to a graduate program is transfer credit and is subject to the above stipulations. Up to 9 graduate transfer credits may be applied to the M.S. degree and up to 24 graduate transfer credits may be applied to the Ph.D. degree provided the minimum residency requirements are met.

CURRICULUM

Ph.D. Degree

The doctoral degree program in CMB requires **51 credits**, at least 30 of which must be in approved course work. Students must maintain a B (3.0) average in **approved** course work to remain in good standing. There is no impediment to students wishing to take more than 30 hours of course work, as the Graduate College requires only 20 hours of thesis research. The academic curriculum is intended to complement rigorous training in experimental laboratory science. The minimum of thirty hours of approved course work required of all CMB Ph.D. students is divided between required and elected courses.

Course Requirements (total of 30 credits):

Cell and Molecular Biology 301-302

6 credit hours

Comments: This course intends to provide a basic understanding of the internal organization of the cell and the molecular mechanisms that regulate intracellular and extracellular processes (i.e. DNA replication, transcription, protein synthesis, cell proliferation, migration, cell-cell contact, cell death) and specific cell functions.

Biochemistry 301-302

6 credit hours

Comments: This course intends to provide a basic understanding of the concepts of cellular processes and biological chemistry that are fundamental to all areas of inquiry within the CMB Program.

Area of Genetics

3 credit hours

Comments: As a Cell and Molecular Biology Program, students must have at least three credit hours in the area of Genetics/Molecular Biology that will complement the basic concepts learnt in 301-302. A list of courses in molecular biology/molecular genetics that presently meet this requirement will be made available each year.

Area of Quantitative/Analytical Biology

3 credit hours

Comments: This requirement can be fulfilled with courses in the areas of Bioinformatics, Statistics/Biostatistics, Physical Chemistry or Physical Biochemistry.

Literature-based seminar courses

4 credit hours

Comments: These courses are based on the review of current literature (versus text book), active discussion and individual student presentations. Currently, there are at least 5 such courses offered around campus in several different departments, *i.e.*, MMG310, ANNB320, ANNB323, BCHM381, PATH375, BIOL371. The subject matter of these courses usually changes every semester, so students should be able to identify subject areas of interest.

CMB Seminar (CLBI 381)

**2 credit hours
(1 credit/year)**

Attendance for the weekly CMB Student Seminar Series is required of all students throughout their period of study. To receive your annual credit you must attend 90% of the seminars and present your work in this forum on an annual basis, beginning during your second year. Although only 2 credit hours are required in this area, it is also a requirement of the CMB program the 90% attendance and annual presentation as long as you remain as member of the program. This is a friendly forum in which you can learn to present your work and it is an important mechanism to give a feeling of community to the Program.

The Seminar setting is important to your development as a scientist. We all must present our work effectively or it is not understood or appreciated. Our students clearly benefit from having this practice setting as judged by the number of prizes CMB students win on University research presentation days!

CMB Laboratory Rotation (CLBI 295)

3 credit hours

Please see the section on pages 15-16 regarding guidelines for Rotations.

Advance Electives (total of 3 or more credits):

The required academic course work listed above represents 24 credits. The remaining 3 of the 30 credit hours of approved course work must come from advanced elective courses. These are usually listed as Special Topics 295 in many departments. Lists of advanced electives will be made available each year and regularly reviewed.

M.S. Degree

The M.S. degree program in CMB requires **30 credits**, at least 15 of which must be in approved course work and 6 must be research credits. The remaining 9 credits can be a combination of course and research credits as approved by the student's advisor and studies committee. Students must maintain a B (3.0) average in **approved** course work to remain in good standing. The academic curriculum is intended to complement rigorous training in experimental laboratory science. The minimum of 15 hours of approved course work required of all CMB M.S. students is divided between required and elected courses. Like Ph.D. students, M.S. students are required to take both CLBI 301-302 and BIOC 301-302. The remaining 3 credits of required course work may include the rotations course (CLBI 295) and/or up to 2 credits of CLBI 381 seminar. Master's students are also required to pass the Comprehensive Qualifying Exam but are not required to take the Proposal Exam (see below).

	<u>Ph.D.</u>	<u>M.S.</u>
Minimum Course Credits	30	15
Minimum Research Credits	20	6
Minimum TOTAL	75	30

M.D./Ph.D. Student Requirements

M.D./Ph.D. students entering the CMB Program to complete the Ph.D. part of their program are required to take 12 credits in Cell and Molecular Biology courses, including CLBI 301-302 (or its equivalent), and at least 6 credits in advanced seminars or literature based discussion courses. The remaining course and research credits required for completion of the Ph.D. degree can include medical school course work which is approved for graduate credit and in which a grade of B or better was achieved. At least 6 of the credits must be in biochemistry. M.D./Ph.D. students are expected to participate in all other facets of the CMB Program, including the Student Seminar Series. M.D./Ph.D. students are required to pass both the Comprehensive Exam and Thesis Proposal Grant by the end of their fifth semester in the CMB Program.

Grant Proposal Requirements

During the course of the first five semesters in residence, graduate candidates will be required to prepare two NIH-style grant proposals, one for the **Comprehensive Qualifying Examination** and one for the **Thesis Proposal**. During the course of a scientific career, grant

writing is one of the most important skills that influence professional success. Although the requirements of the two proposals are different, they serve the same general purpose: to refine the ability of students to write clear and cogent proposals that describe the background, hypothesis, rationale, methods and specific aims of a research project.

Comprehensive Qualifying Examination

Candidates for the Ph.D. and M.S. degrees shall write a National Research Service Award (NRSA)-format research proposal, and defend the proposal in an oral exam, by the **end of their fifth semester** in residence. The subject of the research proposal should differ substantially from the students' own research area or experimental approach, but should involve contemporary questions and methods in cell and molecular biology. The process is initiated by submitting to the CMB Education Committee a two page document in standard NIH NRSA format (see below) that includes an introductory abstract, hypothesis and specific aims of the proposed research. Once the subject area is approved by the Education Committee, the student will have 60 days to submit the written proposal to the Qualifying Examination Committee. The responsibility for assembling an Examination Committee rests with the student; the Qualifying Examination Committee should consist of one member of the CMB Education Committee, one member of the students' thesis studies committee (but not the thesis advisor) and one faculty member from any department who has expertise in the research area. Inclusion of a member of the Thesis Studies Committee provides an avenue for that individual to report the results of the exam process directly to the Thesis Studies Committee.

1. Written Grant Proposal

The qualifying research grant should be written in the style of an NIH NRSA proposal. The PHS 398 forms for the face pages, abstract page, and continuing pages are available in the Office of Sponsored Programs (<http://grants1.nih.gov/grants/funding/phs398/phs398.html>), 231 Rowell Building. An acceptable grant will typically include the face page, abstract, hypothesis, specific aims, detailed research plan, and references. No preliminary data is expected, but figures that provide background or details of experimental methods are useful. The body of the typical grant will be about 10-12 single spaced pages, including figures and charts, but not including references. The typical grant will require the student to read and synthesize the information from 25-50 primary research articles and reviews. Although it is expected that the student will organize and write the proposal with guidance from their advisor, and other local experts if necessary, the student will assume full and final responsibility for the proposal, and for the acquisition of sufficient mastery of the chosen subject area to defend the proposal. Once the written proposal is deemed satisfactory by the examination committee, the student is responsible for scheduling an oral defense within 30 days. If the written proposal is judged unsatisfactory at this stage in the qualifying exam process, the student will be asked to revise it within 30 days, resubmit it to the CMB Education Committee, and then schedule the oral defense. CMB faculty will not participate in the oral defense of written proposals that are poorly organized, lack references, or are otherwise incomplete or substandard.

2. Oral Defense of the Qualifying Proposal:

At the oral defense the student will present a 45-60 minute presentation outlining details of proposal, including background, hypothesis, rationale, specific aims and research methods. During the oral defense, the examination committee shall be free to explore the knowledge of the student on a range of subjects related to the proposal and the core curriculum course work in cell biology and biochemistry. The student is expected to understand the background of the research area, rationale for using specific approaches, basis for the experimental methodology, and how alternative approaches may contribute to execution of the project.

3. Evaluation of the Qualifying Proposal:

At the conclusion of the oral defense, based on consideration of both the written proposal and oral defense, the examination committee will render one of several decisions:

Pass. In this instance, any deficiencies in the grant are considered to be so insignificant that revision is not necessary.

Pass with revision. In this instance, the grant and oral defense are considered acceptable, but the proposal requires revisions based upon the comments of the three committee members. The student shall have two weeks to incorporate revisions into the proposal and resubmit the revised grant to the Examination Committee. If the revisions are deemed satisfactory, the student shall then be awarded a Pass.

Fail. In this case the candidate will be given one opportunity to rewrite the proposal and repeat the oral defense, using the comments from the first grant submission and oral defense as guidance. (This process is similar to resubmitting a grant that has failed to receive a positive review at an external funding agency). If a student fails a second time, she/he will be dismissed from the Ph.D. program. However, the Graduate Education Committee may decide that a PhD candidate has passed at a level commensurate with the requirements of the M.S. program and give the student an opportunity to switch to the M.S. program.

It is strongly advised that students complete both the written and oral parts of the qualifying exam (including second tries if necessary) by the end of their fifth semester in graduate school. Exceptions to this timeline **MUST** be approved by the CMB Director, CMB Education Committee and Thesis Studies Committee well in advance. Reasons deemed acceptable for delayed submission of the proposal include severe health problems, foreign travel for collaborative studies, etc. No exceptions will be granted for conflicts with required courses or other responsibilities inherent in the CMB program. Therefore, students are *strongly advised* to write and defend their proposals during the summer after their second year.

Thesis Grant Proposal

In addition to the Comprehensive Qualifying Exam a written thesis research proposal will be required. This grant proposal is intended to provide the studies committee with a clear plan of action for conducting and completing the thesis research, and as such, the student may be asked to update this proposal annually. Students are required to prepare their thesis research

project in the form of an NRSA postdoctoral fellowship application (Form PHS 398, available in the Office of Sponsored Programs

(<http://grants1.nih.gov/grants/funding/phs398/phs398.html>), 231 Rowell Building). The thesis research project should be presented in the same format as the qualifying exam proposal: that is, an acceptable grant will typically include the face page, abstract, hypothesis, specific aims, detailed research plan, and references. Ideally, the grant should be prepared in conjunction with a seminar presentation in the student's home department or in the CMB Seminar. Following the seminar, the proposal and seminar will be reviewed in a closed meeting by the Thesis Studies Committee. The student will be required to provide his/her Studies Committee with the grant proposal at least two weeks prior to the oral presentation; a copy should also be provided to the CMB Program Office for other interested faculty to read prior to the oral seminar presentation.

The purpose of the thesis proposal is to provide a well focused plan for pursuing the thesis research project. The proposal must be written by the student and should incorporate preliminary data. Hence, this exercise will require students to present the background material required for their experimental studies in a cogent form, formulate their ideas as precise specific aims, and outline the experimental methods they will use during their thesis research. Preparation and updating of the proposal in the appropriate grant format will be supervised by the Studies Committee. The NIH format will serve to give the student additional experience in grant writing, as is already required by some departments and many training grants. The proposal will also assist the Studies Committee in evaluating students' progress during the course of their thesis research. **Students must complete this requirement by their fifth semester** of training and at least one year prior to their thesis defense. This proposal should be considered a working document that is intended to assist the student, advisor and Thesis Studies committee in organizing, conducting and monitoring the student's thesis research project during the entire duration of their graduate experience in the CMB Program.

Thesis

The M.S. and Ph.D. programs both require a thesis, which is the formal written report of the research done for the degree.

The style and format of a thesis are relatively standardized. It is recommended that you become familiar with the Style Manual for Biological Journals, third edition (1972), published by the conference of Biological Editors of the American Institute of Biological Sciences. In addition, the Graduate Faculty have adopted rules which are specified in "Guidelines for Thesis Writing," available in the Dean's Office. <http://www.uvm.edu/~gradcoll/guidelines.pdf>

Before the thesis defense, a copy of the thesis, in final form must be submitted to the Dean's Office for initial review. Date for the deadlines can be found at <http://www.uvm.edu/~gradcoll/calender.html>.

Thesis Committee and Defense of Thesis

For Ph.D. students, the Thesis Committee usually consists of the Studies Committee. **The Thesis/Studies Committee should be formed as a student enters a laboratory, at the end of the first year. It must then meet at least once annually thereafter.** Names of at

least 2 faculty members from within the CMB program and one outside of the CMB program are recommended by the student's advisor to the Director, who forwards the nominations to the Graduate Dean. The Committee Chairperson, will be designated by the Dean. The date, time, and place for the thesis defense must be submitted to the Dean at least 3 weeks in advance of defense.

For M.S. students, the Thesis Committee is nominated by the advisor in consultation with the Director and appointed by the Graduate Dean. It should consist of 3 members (1 of whom comes from outside the advisor's department) and is usually identical to the Studies Committee.

At least 2 weeks in advance, an announcement of the defense, which includes an abstract, should be sent to all Program faculty and to other appropriate faculty. The Program Office will prepare and distribute the announcement from materials provided by the student.

The oral defense of the thesis should be passed at least three weeks before Commencement for conferral of the degree in May. Dates for the deadlines can be found at <http://www.uvm.edu/~gradcoll/calender.html>.

Students must enroll in either GRAD 399: Dissertation Defense, for M.S. students, GRAD 499: Dissertation Defense, for Ph.D. students, prior to defending their thesis.

Approved Thesis

The original and copies, signed by the Thesis Committee, with necessary corrections made, should be delivered to the Dean's Office no later than two weeks before Commencement. Actual deadline dates will be posted. The Graduate College sends guidelines to advisors each semester. The student who is preparing a thesis should work with the most recent set of guidelines.

Binding of the approved thesis will be done by the Graduate College. Bound copies of a Master's thesis are given to the library (original) and to the advisor. Bound copies of a doctoral thesis are given to the library (original and one copy), the advisor, and the Program office.

Responsibility

It is the joint responsibility of the student and the advisor to see that all requirements are completed fully and on time so that no oversight delays a student's graduation. However, final responsibility falls on the **student** to see that **all** requirements are met.

Continuing Registration

A student who has finished all course and research credit requirements can register for only "Continuing Registration" and remain a full time student. The fee is \$100 and may save funds for students paying tuition out-of-pocket.

DEGREE ASSOCIATED ACTIVITIES

Required Seminars and Journal Clubs

Students are required to attend the CMB seminar series on a regular basis and should register for CLBI 381 each semester. The chair for each individual seminar is responsible for introducing the speaker as well as passing around, collecting and handing in the attendance sheet to Erin Paveglio in the Program Office, C242 Given.

The faculty have also organized less formal journal clubs around particular topics. Students are encouraged to participate in all that are pertinent to them.

Topics Include:

- Molecular Biology/Development (BIOL 284)
- Signal Transduction (Dr. Judith Van Houten),
- Nucleic Acids Super Group (Dr. John Burke),
- DNA Repair (Dr. Susan Wallace),
- Immunology (Dr. Ralph Budd).

Travel to Scientific Meetings

The Program encourages graduate students to attend national and regional scientific meetings and to present papers at these meetings. "Mini" grants for travel and other expenses are available on a competitive basis from the Graduate College and are matched by the advisor or Program as these funds are available. Applications are called for by the Graduate College each fall and spring. Notices will be sent out to students as Program funds are available to match "mini" grant applications. More information can be seen at <http://www.uvm.edu/~gradcoll/?Page=finaid.html>

Participation in University and Program Decisions

The University of Vermont and the Cell and Molecular Biology Program attempt to provide as many opportunities as are appropriate for expression of opinion by graduate students and for direct involvement in decision making. A graduate student representative serves on the Steering Committee. The Director meets with students as a group once per semester to facilitate communication between students and faculty.

PROGRAM STRUCTURE

FACULTY MEMBERSHIP

Members of the CMB Graduate Program shall consist of University of Vermont faculty who are qualified to guide candidates for a Ph.D. degree in Cell and Molecular Biology. Members in good standing will have independent research programs and be willing to participate in the teaching program and Program administration.

Applications for membership shall consist of:

1. a written statement of interest in the Program with a brief outline of research activities that a CMB student could participate in;
2. a biosketch including past education and professional experience;
3. any other data deemed appropriate by the Steering Committee.

Applications shall be processed by the Faculty Review Committee, and membership will be awarded for a 3 year period, and will be renewable upon review by the Faculty Review Committee. Upon periodic solicitation, members shall provide the Faculty Review Committee with evidence of continued participation in Program activities. This information will include:

1. A list of publications during the past 3 years, describing relevant research and presented in refereed journals, and any other evidence of an active research program (e.g. grant support).
2. Courses that a member participates in which are pertinent to the training of students in the CMB Program. This also includes training of graduate and post-doctoral fellows and participation in courses of potential interest to CMB students.
3. Administrative activities performed for the Program. This includes service on qualifying and thesis committees, willingness to serve on standing and ad hoc committees for the Program, and participation in recruitment and interviewing of new CMB students. In addition, members shall regularly attend CMB student seminars (at least 25%), be willing to assist in periodic review of student presentations, and actively participate in CMB membership applications.
4. Residency requirements. There must be evidence of an appropriate research environment and of interaction with Program activities, especially for graduate training.

COMMITTEES As of May, 2004

Steering Committee - Standing

Advise the Director on all aspects of the program but particularly work on the review of student applications in conjunction with the Recruitment Committee. Each faculty member of the Steering Committee is a Chair of one of the sub-committees.

Chris Berger, Chair
Nick Heintz
Albert van der Vliet
Karen Lounsbury

Mercedes Rincon
Ravi Misra (student)
Sarah Hale (student ad hoc)

Education/Curriculum Committee - Standing

The CMB Education Committee is responsible for generating specific policies and guidelines for evaluating and monitoring those aspects of the CMB graduate experience that relate specifically to the educational mission of the program, including but not limited to: 1) the structure of the laboratory rotations, 2) the student teaching experience, 3) the recommended course curriculum, and 4) the qualifying exam and thesis studies grant proposals. The committee shall consist of 3-4 CMB faculty members appointed by the Program Director, with the Chair as a member of the CMB Steering Committee.

Nick Heintz, Chair
Mary Tierney
Jeanne Harris

Alan Howe
Sara Paveglio (student)

Faculty Review Committee - Standing

Review all new CMB faculty candidates as well as current faculty on a 3 year cycle. Faculty need to demonstrate publications, funding, participate in CMB student training and courses, attendance at seminars (25%), and willingness to participate on committees.

Albert van der Vliet, Chair
Yvonne Janssen-Heininger
Russ Hovey

Judy Van Houten
Jim Vigoreaux

Recruitment Committee - Standing

Attract the best students (updating Peterson's listing, posters, target school visits), and help organize visits to campus by competitive candidates.

Karen Lounsbury, Chair
Stephen Everse
Sally Huber

Markus Thali
Dan Weiss
Nicholas Farley (student)

Charges of the Recruitment Committee

The recruitment committee is responsible for both promoting the CMB program as well as assisting in the selection of candidates including application review, interviews, and hospitality of the interviewees. The committee is generally made up of 3 faculty members, with a chair who also serves on the CMB steering committee. The committee is expected

to meet at least once prior to the interviews to establish the outline of events during the interview. The committee will work closely with the CMB administrative assistant to organize and carry-out organized events such as dinner/breakfast/reception. The major workload of this committee takes place during January and February. The specific outline of expectations includes:

1. Promote CMB program to students at UVM and other Universities
 - a. Help with website recruitment pages
 - b. Present a slide of the CMB program when teaching undergraduate courses or when giving seminars where undergraduates attend

2. Assist with the application process
 - a. Be available to answer questions from applicants
 - b. Participate in applicant review and interview selection

3. Take an active part in the interview process
 - a. Help put together packets to distribute to applicants
 - b. Attend breakfast or dinner with applicants
 - c. Be available to interview applicants
 - d. Assist with selection of applicants

Seminar/ Student Progress Committee - Standing

Organize student seminars; get their abstracts sent out by email to CMB members, and take attendance and reviews of students for their feedback.

Mercedes Rincon, Chair
Matt Poynter

Jonathan Boyson
Cory Teuscher

Web Site Committee - Ad Hoc

Update the CMB web site; get it better integrated with UVM home page, COM, and FAHC. Most important is to get all CMB faculty to do their home page as a pre-requisite to being listed on the CMB website.

Chris Berger, Chair
Ralph Budd

Charlie Irvin
Marcus Bosenberg

FACILITIES

LIBRARIES AND SERVICES

The University of Vermont libraries provide important literary resources. Journals primarily biological, environmental or evolutionary tend to be found in the Bailey-Howe Library, while journals which are primarily physiological, biochemical, or cellular are more likely in the Dana (Medical) Library. Both libraries have copying facilities and are quite prompt in processing interlibrary loans for material not at UVM. There are free computer search facilities at both libraries. Online access to some journals is provided to UVM affiliates. Later in the semester, you might want to sign up for lessons on how to conduct reference searches on **Medline** through the Bailey Howe Library. <http://library.uvm.edu/dana/guides/help/ovidmedline.html>

CORE FACILITIES

Bioinformatics Core Facility

Contact Jeff Bond for information on the bioinformatics core facility.

Center for X-Ray Crystallography

Several research groups at UVM utilize X-Ray crystallographic techniques in their research. UVM is home to an X-Ray Core facility located in the Given Building (<http://www.uvm.edu/~uvmsbf/cxx/>).

Computer Facilities

A number of laboratories have microcomputers, the use of which is determined by the laboratory director. In addition, most departments have terminals that are connected to the University mainframe. Graduate students can sign up for free accounts on the main frame computers by going to Computing & Information Technology in the Waterman Building. Free mini courses are offered by Computing & Information Technology to assist you in computer use, statistical analysis, word processing and graphics. Take advantage of these courses.

DNA Analysis Facility

The DNA Analysis facility offers a wide range services such as DNA sequencing, DNA fragment analysis, real-time quantitative PCR, Luminex analysis, as well as a variety of computer programs for designing and analyzing data. The facility is located in HSRF305, and more information on pricing and services can be found at <http://www.vermontcancer.org/research/shared/dna/index.html>.

Flow Cytometry Facilities

Two Flow Cytometry Facilities are available for use at a fee. One is located in HSRF307 (<http://www.vermontcancer.org/research/shared/flow/index.html>), and has an EPICSFlow Cytometry System. The other is located in Given D307 and has a BDLSRII and a BD FACSAria cell sorter.

Medical Photography Facility

Med Photo provides more than just photographic services. The staff also supports the Audio/Visual equipment located in Given Hall A and Hall B in addition to portable A/V

equipment. Their office can be found in Given C-124. For information on their services, log on to <http://www.med.uvm.edu/medphoto/HP-DEPT.ASP?SiteAreaID=513>.

Microarray Facility

Microarray analysis is available at the Microarray Core Facility. To learn more about the Microarray Facility, go to

<http://www.vermontcancer.org/research/shared/microarray/index.html>.

Microscopy Imaging Facility

Located in HSRF203, the MIF houses state of the art microscopes at a fee for service basis, along with a staff that offers professional consultation on the use of the equipment, experimental design, and interpretation. Their website is

<http://www.vermontcancer.org/research/shared/imaging/index.html>.

Molecular Methods

See the VCC website for more information.

Transgenic Mouse Facility

Headed by Mercedes Rincon, the Transgenic Mouse Facility currently provides the service of generating new transgenic mouse strains from user-provided DNA constructs. In the future, this facility will offer services to generate gene knock-out mouse strains.

Vermont Cancer Center

VCC was founded in 1974 and throughout its history has been committed to providing state-of-the-art research, treatment, and education—in accordance with the Center's mission. As the focal point for cancer-related activities in Vermont and northern New York, VCC plays an important role in the lives of the people it serves. This role was intensified in 1995, when a major reorganization of the UVM College of Medicine healthcare delivery system took place. This reorganization led to the creation of Fletcher Allen Health Care, a not-for-profit healthcare system.

Through a regional healthcare network established by Fletcher Allen, VCC has close ties to the community hospitals that provide care to cancer patients. These ties, in combination with the unique nature of the region's rural and relatively stable population, have created an ideal environment for cancer research. VCC research is currently organized into four thematic programs: Cancer Prevention and Control, Clinical, Cell Signaling and Growth Control, and Genome Stability and Expression. Visit www.vermontcancer.org for more information.

Vermont Lung Center

The Vermont Lung Center (VLC), a Program on Lung Biology and Disease, has been in existence at the UVM College of Medicine since 1972. It has had a rich and productive past that has had a significant impact nationally. The keystone to the VLC program is translational research. The goals of the VLC are to investigate the mechanisms of lung biology and disease, and to train and retain outstanding translational scientists at UVM. Our key product is excellence. The current program centers around a 5-year award by the National Center for Research Resources (NCRR) of the NIH. The VLC is a NCRR Center of Biomedical Research Excellence (COBRE). www.med.uvm.edu/vermontlung

Please refer to the CMB Program website for updates to this list.

OFFICES OF INTEREST

The Program Office

The Program Office is located in C242 Given. Support staff, Erin Paveglio, can be contacted by calling 656-9673 or by email at erin.paveglio@med.uvm.edu. The Director of the CMB program is Dr. Chris Berger. He can be found in HSRF 118, or by phone at 656-0832, e-mail: berger@physiology.med.uvm.edu.

The student files are located in the Program Office as are mailing lists, seminar lists, guidelines for comprehensive exams, and other valuable information. You may examine your file, but it may not leave the office.

The Graduate College Office

The CMB Program is administratively below the Graduate College. The friendly faces in 332 Waterman can help with questions regarding stipends, taxes, G.P.A., etc. The phone number is 656-2699.

Biology Office

Mail boxes are available in Room 120 Marsh Life Sciences Building for all first year students and in individual departments for other students.

Please keep your home and office address current at the College and CMB Program Office; the mailings to you are very important.

The Office of Sponsored Programs

The Office of Sponsored Programs is an important and very helpful resource located in 231 Rowell Building. A list of available student grants is published through this office. They will also conduct specific computer searches of special funding source upon request.

Campus Office Space

Generally, you will find that office space has been reserved for you in the department in which you've arranged to work. If you have not selected an advisor yet, don't worry; space, keys, and a mail box will be arranged for you in the Biology Department in the Marsh Life Science Building. At the introductory meeting with the Program Director you will be given information on teaching assignments. Teaching fellows and Research Fellows with Program support should report to the Biology Office, where you will be assigned keys, a mail box and study carrel.

The Program Office should be advised of your address. Teaching fellows should report to the departments supporting them. It is important to know your campus address as soon as possible so you can receive important campus mailings. Deadlines for mini-grants (described elsewhere in this booklet) and special programs for graduate students are well advertised by direct mailings from the Graduate College.

Radiation Safety Office

The Radiation Safety Office (RSO) at the University of Vermont oversees the use of ionizing radiation on campus and ensures compliance with state and federal regulations, to protect UVM employees, students, the public and the environment. The RSO also provides safety related services for UVM. There are more than 500 faculty, staff, and students using ionizing radiation and radioactive producing devices for research and educational purposes in more than 120 labs in 11 buildings. Any person wishing to use radioactive material must become certified to do so. More information can be found on the RSO website <http://uvm.edu/~radsafe>.

Office of Animal Care Management

Any person who works with animal models in their research is required to become certified to do so by completing an online training session. Please visit <http://cats.med.uvm.edu/oacm/> for more information.

CHEMICAL RIGHT TO KNOW AND LABORATORY SAFETY

Laboratory safety, whether in a research setting or in teaching laboratories, requires an understanding of both the physical risks involved, and of regulatory requirements from OSHA and VOSHA, the Vermont counterpart. In addition, the UVM Environmental Safety Facility has established laboratory audit protocols to provide institutional oversight of chemical handling and storage in UVM laboratories. Understanding how these requirements fit together is particularly important with regard to the employees "right to know" about chemicals. Information about all chemicals in a laboratory must be readily available to all users of that laboratory.

There are two necessities in the lab. First, laboratory safety must be a desire of the individual, for self protection and for protection of one's associates. Secondly, there must be a clear set of procedure and conduct rules for both general and specific situations.

It is the responsibility of a person conducting a teaching laboratory to convey these attitudes and rules to the students under her/his supervision. In a research laboratory this responsibility lies not only with the Principal Investigator but equally with each of the independent investigators who make use of the facilities.

All lab personnel must be trained by the Environmental Safety Facility. Refer to <http://esf.uvm.edu/> for training

Possible Laboratory Hazards

- Improper storage of chemicals
- Improper disposal of chemicals
- Uninformed use of toxic, flammable, and explosive reagents
- Faulty or careless techniques
- Faulty handling of equipment
- Lack of proper room or fume hood ventilation
- Failure to use safety equipment or protective clothing
- Burns from flames, chemicals or hot glassware; freezing
- Electrical shock
- Radiation exposure
- Delayed first aid treatment
- Inattention, fooling around, failure to follow established rules

General Rules

- ✓ Use proper laboratory conduct, and require the same of your co-workers.
- ✓ Know how to contact help in an emergency. To reach UVM police, **Phone 911** from a campus phone. Cell phone will not reach UVM Police, but rather the Chittenden County dispatch center.
- ✓ Know the location and proper use of fire extinguishers, showers, eyewashes, first aid supplies, and fire exits.

- ✓ Observe all established protocol and recommendations; state and enforce rules for your students which are appropriate for each laboratory you teach.
- ✓ Use and require your students to use eye protection, protective clothing, and protective equipment as recommended, and to confine long hair and loose clothing.
- ✓ Know and convey to your students the flammability, reactivity, corrosiveness, toxicity and other hazards of chemicals you are using.
- ✓ Do not work alone with potentially dangerous chemicals and equipment; do not allow students to work in the laboratory without adequate supervision
- ✓ Use the fume hood when handling chemicals that are toxic, irritating or highly reactive. Check the hood airflow before using, and at least daily when in constant use.
- ✓ Check room ventilation frequently.
- ✓ Keep work area clear of excess chemicals and equipment.
- ✓ Thoroughly understand the equipment you are using.
- ✓ Do not leave equipment running unattended.
- ✓ Do not eat, drink, or smoke in the laboratory.
- ✓ Know and use the proper storage and handling for chemicals. Waste chemicals should be properly stored, and disposed of promptly at the next hazardous waste pickup. (The University picks up and disposes of hazardous wastes upon request, made by using the Hazardous Waste Tag. Call 656-5400 for more information about this procedure.)

The various federal and state requirements for the use of hazardous chemicals in UVM laboratories are incorporated into the UVM Environmental Management Plan, which can be found on the web at <http://esf.uvm.edu/uvmemp> Contac the Environmental Safety Facility with any questions about this plan at esf@uvm.edu or 656-5400.

If a personal injury should occur it is required that the injured person fill out an *EMPLOYEES FIRST REPORT OF INJURY FORM*, provide a copy to the Program office and file it with the Risk Management office.

Hazardous teaching laboratory situations which are not being properly addressed should be reported to the CMB Director, Chris Berger. Every effort will be made to take corrective action.

Emergency

Help is available from the following numbers.

Campus Emergency		911
UVM Police	284 East Avenue	6-3473
Environmental Safety Facility	667 Speer Street	6-5400
Biology Business Manager	120 Marsh Life Science Building	6-2922