Greetings From Our Director and Co-Director

We welcome you to the U VA Biotechnology Training Program, a new opportunity for Ph.D. science students that adds hands-on corporate research experience, Biotechnology Journal clubs, Biotechnology seminars, and yearly Biotechnology retreats to high quality dissertation training. Our students will graduate with a wide selection of career opportunities in this rapidly expanding area of study that spans multiple disciplines. Many thanks to all of you for your considerable efforts to make this program possible.

How will the program work? We expect most Biotech trainees will be accepted into the program in the spring of their first or second Ph.D. year at U VA. Entry is via a competitive application process. A minor mentor to complement the home department major mentor is chosen, and core Biotechnology Training Program courses are completed (Biochemical Engineering + Cell Structure/Function or Biological Chemistry + one additional from the BTP course list). Students participate in a 1-4 month industrial externship within the first two years in the Training Program, the latter kindly arranged by Tim Redden and Anne Watkins who interview each trainee to match interests with company themes. The emphasis then turns to good innovative science, quality publications, patents and the dissertation.

We have an outstanding entering class of seven energetic and intelligent students. Currently all are in Engineering, a reflection of the top picks from last year’s applicant pool. Tom Gervais has both undergraduate (Penn State, ’97) and ME (U VA, ’99) degrees in Chemical Engineering and is currently working with major mentor John Gainer on bioproduction by immobilized yeast. His minor mentor is John Herr. Larry Lanning is also a Chemical Engineer (Ohio U., ’97). Larry just defended his ME and will be pursuing his BTP PhD with mentors Roseanne Ford (major) and Rick Horwitz (minor) on bacterial transport. Serving as editor of the newsletter is Eric Park. Eric received his BSE in Biomedical Engineering from Duke (’98). With mentoring from Mike Lawrence (major) and Rick Horwitz (minor), Eric will be studying selectin-ligand interactions in thrombosis. Biomedical Engineer Michael Smith (BS, U Memphis ’99) has selected major mentor Klaus Ley and minor mentor Roseanne Ford to examine the effect of shear rate and shear stress on leukocyte adhesion. Michael S mood has a background in Mathematics and Environmental Studies (BA, Colby College ’94) with a focus on Systems Engineering (MS, UVA ’00). Michael is just back from Bangladesh where he is setting up a data analysis company with a Darden student.
Getting the Most from Your Graduate Experience

by Leana Topper
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THE FOUNDATION OF A good scientist is built in graduate school. Although at the time progress can seem painfully slow, scientists often look back over their graduate years and consider how quickly the time passed. By taking advantage of the many opportunities during graduate training, students can become well-rounded scientists, and potentially avoid regret in later years. Following are suggestions to make the path through graduate school less rough and more rewarding.

The Technical Challenge
Unlike graduate students in the humanities, who are required to propose a thesis for admission, graduate students in the basic sciences usually have the opportunity to complete several laboratory rotations before choosing a thesis advisor and designing a project. These short periods of research in various labs allow students to gain knowledge of diverse techniques, to build a strong foundation for bench work, and also aid in understanding the literature. Even after choosing an advisor, it is wise to learn as much as possible about a wide range of techniques that will be useful in a post-doctoral or first independent position. In addition, students with knowledge of diverse techniques are valuable sources of information for their training lab.

Organization
Organization is critical to maintaining sanity. Although the advisor is a graduate student’s guide, the student is accountable for doing the background research and pushing the project ahead. Critical examinations of the published literature are essential to forming the framework of a project and keeping up with advancements in the field. It is impossible to read or plan too much. Short and long-term organization will help determine and retain a clear direction for a project. Keep a calendar of experiments and other preparations that need to be done a week in advance. Planning experiments on a daily basis will help avoid frustration and indecision. Planning for the long term is more difficult and requires more flexibility, but can be as simple as listing which parts of a project should be accomplished in the next three months. Without clear planning, it is all too easy to lose direction and, as a result, a sense of self-worth.

Along with a plan to carry out the work, decide how to collect the data in an organized fashion. Proper documentation can pre-empt having to re-do work and serves as a potential reference for months, sometimes even years later, when a particular technique may again be needed. Planning for both the short- and long-term also teaches prioritizing skills that will be useful later in juggling the many responsibilities of a career.

Get Involved
Most graduate programs have some type of student organization. For departments without this type of council, students can speak to faculty and the department chair about forming one and funding it. Students with access to this resource should use it. The academic gatherings provide through this type of organization offer a forum to give presentations and an opportunity to ask questions in an atmosphere that is more relaxed than a typical department seminar or meeting presentation. Also, discussions among peers help hone critical thinking and scientific thinking skills. These groups may also sponsor social events—a great way to build friendships. The best support during graduate school will most likely come from peers. Moreover, classmates can be valuable allies in the future.

Mentoring
The thesis advisor is considered a graduate student’s principal mentor, so it is imperative to develop a good working relationship with the advisor. However, the members of a student’s thesis committee can also be valuable guides. Do not wait for a committee meeting to discuss research directions or other concerns with committee members. In addition, faculty members both in and outside the department may be excellent sources of insight and advice. Make appointments and visit them. Though it may be intimidating at first, overcome the fear of asking for help. Also, remember that graduate students are in a position to be mentors to other graduate students or to undergraduates who may be working in the department. Instructing others on techniques can expand the instructor’s knowledge, while discussing thesis projects with others may rekindle excitement for one’s own work.
Networking
Meetings and conferences are significant opportunities to broaden graduate students' knowledge within and beyond

Professors Patricia Franklin and Ruth Douglas of Radford Virginia Community College at our program's kickoff luncheon. Information about PVCC's biotech lab training program can be found at http://www.pvcc.edu

their field of interest. Attend a meeting or conference each year not just to look at posters and listen to presentations, but also to step forward and ask questions about the research presented. Don't pass up the timely chance to meet new people, discuss projects, and find answers to common technical problems. It is also an occasion to meet future post-doctoral advisors and potential employers.

Individual Initiative
Completing graduate school is a long and, at times, difficult adventure. Ask yourself what you expect from your graduate training and then make a plan for reaching those goals. Your project is unique, which means you must learn to think and act independently; take control, and accept the responsibility for the direction of your work. Doing so may lessen some of the worry and pain along the way to obtaining a degree, and build a strong foundation for becoming an exceptional scientist.

Leona Topper recently received her PhD from the Department of Cell Biology, UVA.

Company Spotlight: Merck-Stonewall

by Eric Park

THIS SUMMER, STUDENTS FROM THE BIOTECHNOLOGY TRAINING PROGRAM were given the opportunity to tour the Merck-Stonewall manufacturing facility at Elkton, VA. Tour guides Drs. Ray Stapleton, Robin Reed, and Doug Gravitt took time off from their schedule to answer questions and give an overview of the technical operations performed at the facility. Our group was given a tour of the fermentation, sterile operations, and finished pharmaceutical divisions. Often a product that is fermented at the Merck-Stonewall plant is transported to a different facility to be purified and processed there. In addition to manufacturing human therapeutics such as Crizivax for HIV and Pepsid for heartburn relief, the facility also produces veterinary treatments for heartworm and radioactive B-12 that is used as a diagnostic aid in the hospital. The plant also handles operations such as separations, bulk synthesis, and formulation.

Research performed at the Elkton plant is mostly done in support of chemical processing. A 75-member team of scientists and engineers, which is composed mainly of chemists, chemical engineers and microbiologists, oversees the collaborative effort that covers all aspects of pharmaceutical development. Their team has evolved from recruiting at specific departments and through contacts that the company has with each school. However, our tour guides expressed a strong interest in hiring graduates from other departments especially with the initiative of the applicant of a particular project. Such examples have provided previous internship opportunities in areas such as computer applications and environmental engineering.

Interns at the Merck-Stonewall plant have come from institutions such as Virginia Commonwealth University, Virginia Tech, James Madison University, University of California—Santa Barbara, Michigan, and places as far away as Calgary and Spain. However, the company admits that it is a lot easier to recruit and employ out of UVa due to its close proximity and academic standing. While at the company, interns get an opportunity to discover what a career in an industrial setting entails. Typically the duration of the internship will range from 6 weeks to 4 months. During their tenure at the Merck-Stonewall plant, an intern might have 2–3 projects to work on or might engage in one large project. Before actually starting, an intern must complete a number of safety and training courses at the company that cover topics such as environmental regulations and good manufacturing practices. An intern is usually paired up with an employee for the first few days to get oriented and discuss the objectives of their project. Afterwards, the student is then given the chance to direct the bulk of the endeavor with limited supervision. Many of the interns that have previously worked at the Stonewall plant have continued to work in Elkton or at other Merck facilities.
Fall/Winter Seminars

10/2/00
Jacqueline Eberwine, Professor, Department of Pharmacology and Psychiatry, University of Pennsylvania Medical Center
"Microarray Analysis of Single Cells: Insights into Neuronal Functioning"

10/23/00
John Herr, Ph.D., Department of Cell Biology, University of Virginia
"Sperm Proteomics"
www.med.virginia.edu/lipidprograms/gpcc/biotech/jhck/k.html

11/13/00
Ron Taylor, Ph.D., Department of Biochemistry & Molecular Genetics, University of Virginia
"Targeting of Pathogens to the Primate Ennencephale Complement Receptor: A Privileged Site?"
Dr. Taylor was recently named UVA's Inventor of the Year. article available at www.virginia.edu/nriddleva/2000/11/taylor.html

2/5/01
Ralph Schwall, Ph.D Genentech
Topic: TRA
www.med.virginia.edu/lipidprograms/gpcc/biotech/schwall.html

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Biology at Virginia
The Newsletter of the University of Virginia Biotechnology Training Program

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GREETING, from page 1

Michael will be applying Systems Engineering approaches to human genome data with mentors Stephanie Guerlin (major) and Bill Pearson (minor).

Tara Tibbs (BS, Ohio U '98; MS, UVA 2000) is based in Erik Fernandez’ lab where she is examining protein conformation changes during hydrophobic interaction chromatography. Her minor mentor is Jay Fox. Classical guitarist and soccer star Antonio Ubiera received his BS from NC State in '99. Antonio is working on immobi-

lized enzyme systems with mentors Giorgio Carta (major) and Gary Balian (minor).

This is a wonderful time of growth and development for Biotechnology at UVA. By striv-

ing for quality at every step of our training program we can contribute greatly to the career success of our students. We look forward to working with you and appreciating your input. ■