DR. ISA HUSSAINI HAS BEEN chosen as the featured Biotechnology Training Program (BTP) faculty member because of his continued work and support of the BTP. Dr. Hussaini joined the BTP faculty in the fall of 2001. He served for three years as director of the BTP Journal Club. After completing his doctoral training with Professor T.Y. Shen (UVA, 1987-1989) and Dr. Goniak (UVA, 1989-1990), did additional research abroad, and then returned to UVa as a Research Associate in 1993.

Throughout his research career, Dr. Hussaini has produced an extensive publication record in the field of neuro-oncology with a specific focus on investigating glioblastoma invasion in cultured cells and xenograft animal models. Currently, his major laboratory interests are on understanding the regulation and function of Low Density Lipoprotein Receptor-related Protein (LRP) in glioblastoma migration/invasion and PKC-in regulation of astrocytoma invasive growth. In addition to his two active NIH sponsored RO-1 grants, Dr. Hussaini is a participating investigator in various Neurosurgical/Neuro-Oncology translational trials.

Dr. Hussaini is also a recipient of a collaborative agreement grants from Genentech Biotechnology (San Francisco, CA) to investigate the role of Her-2 in meningiomas. He is actively collaborating with Drs. Mark E. Shaffrey (Neurosurgery), David Schiff (Neurology), Adam Goldfarb (Pathology), Tom Sturgill (Pharmacology) and Sally Parsons (Microbiology).

Dr. Hussaini, Associate Professor of Pathology and Neuroscience, has served as a minor or major mentor to: Shannon Beck (BTP Alumna), Patrick Martin, (BTP Alumna, current post-doc), Antonio Uberia (BTP Alumna), and Victoire Kelley (current BTP student). Additionally, he is directing the research of numerous other research associates, graduate students, and undergraduates. Dr. Hussaini serves on two NIH study section review panels and the American Cancer Society tumor biology and endocrinology review group.

Recent Publications


3. Elagib KE, Xiao M, Hussaini
NIH Site Visit Reviews Biotechnology Training Program

By Michelle Kofron

IN 2000, UNIVERSITY OF VIRGINIA SCHOOL OF MEDICINE WAS GRANTED $1 MILLION OVER five years from the National Institute of Health to implement a Biotechnology Training Program. One year ago, Dr. Gordon Laurie, the program director, submitted the first BTP competitive renewal grant. Following the grant submission,

Dr. Laurie was contacted by NIH to arrange a site visit. One week prior to the NIH site visit, a mock NIH panel composed of several BTP faculty, including Drs. Thomas Skolak, Mario Geyser, Eric Fernandez, Gordon Laurie, Roseanne Ford, and Klaus Ley, posed questions to the students. The students agreed this session helped to familiarize them with the process ahead of time.

The site visit occurred on September 22nd and involved the NIH representatives meeting with approximately fifty people associated with the UVa Biotech Training Program, including UVa administration, the program director, administrator, executive committee, participating faculty, industrial advisors, externship mentors, and student trainees.

The students were divided into three groups based on the length of time they have been in the BTP program. The first group consisted of new inductees to the BTP program. This group now has the special distinction as being the first group to be welcomed into the BTP program by NIH representatives in person. The second group was comprised of BTP students in their first or second year of the BTP program. The majority of these students are actively pursuing externship opportunities, while a couple of students are recently returned from their externship. The third group consisted of senior BTP students, who have already completed the externship requirement. A special appearance by Patrick Martin, BTP/UVa alumna, and UNCE/MERK postdoctoral fellow completed the BTP trainee representatives.

Seven NIH reviewers comprised the site visit team. Dr. Kenneth Lutchen, Chair and Professor of Biomedical Engineering at Boston University, who served as the Chair of the Site Visit Committee, led the group. Each reviewer had a 3’ notebook full of paper in front of him. While the initial scene looked a bit intimidating, the reviewers were quite friendly and jovial. Their quick wit put everyone at ease. During our introductions, Rooshin Dalal was challenged to state the name, department, and project description of a BTP member not in the same department as himself. Thanks to the journal club and BTP outings that give the students time to interact, Rooshin was quick to answer— and correct! Other questions led to discussions on the interaction of students with their minor mentors, the advantage of being a BTP member, and the value of an externship experience. Students were also asked to state the advantages and shortcomings of the BTP program. Overall, the students expressed a high level of satisfaction with the program and full support for the grant renewal.

Editors note: The BTP has been refunded for five more years with a stellar score of 157.

National Institute of Health Features BTP on Web

By Leslie Fox

The NIH has featured the Biotechnology Training Program (BTP) on their website as an example of NIGMS-funded National Research Service Award (NRSA) training programs that have exhibited increased success or marked improvement in efforts to recruit and train underrepresented minority students. Learn more about these programs and their recruitment and retention strategies by visiting the NIGMS Training and Careers website at http://www.nigms.nih.gov/training/diversity_examples.html
Externship Experience: ReNeuron

By Rosalind Mott

MY EXTERNSHIP WAS completed in Guildford, England where I worked for ReNeuron Ltd., a stem cell research company. ReNeuron focuses on the development of neural progenitor cell lines for the treatment of diseases like Parkinson’s and stroke. The company was expanding their product line to include cell lines for drug discovery applications. In addition, new pancreatic cell lines were being developed for the treatment of diabetes and retinal cell lines were being produced for the possible treatment of retinal degeneration. My work focused on the production of retinal progenitor cell lines. I designed and implemented protocols to screen clonally derived lines for their potential as retinal progenitor cells. My work on the retinal cell line was in collaboration with the lab of Dr. John Greenwood of the University College of London. In addition, I conducted drug efficacy tests on some of ReNeuron’s research cell lines. My work at ReNeuron spanned a ten-week period and included training at a stem cell repair and regeneration workshop in London.

On my weekends, I spent my time travelling around Britain. I was fortunate to live 45 minutes away from London where I enjoyed visiting the museums and parks. Scotland was a seven hour train ride away allowing me to visit an old friend and colleague and purchase a fine selection of whiskey and fudge. I was very close to the coast and was lucky to see the cliffs of Beachy Head (see picture) and the beaches of Brighton where I consumed plenty of fish and chips.

NIH Experience

By Joe Schmidt

THE NIH STUDY SECTION included a session with several corporate advisors to the Biotech Training Program. These Corporate Advisors provide access and connections with the biotechnology industry and assist in the placement of student externships. Virginia Biotechnology Association Board Member and Corporate Advisor to the BTP, Robert McKown, PhD, Director of the Biomanufacturing Lab at JMU, shared his perspective on the value of biotechnology student externships. Also present were Tim Redden, MBA, and Joe Schmidt of UVA Health System Corporate & Foundation Relations office, to discuss that office’s role in placing students in corporate externships. This included an overview of the process of how students are screened and placed in corporations with the focus on placing students in mutually beneficial, scientifically-based externships in regional, national, and international corporations. A corporate perspective was shared by Jay Reuben, MS, MPH, DrPH, Director of Research & Development at BD Diagnostic Systems, who recently hosted Lori Henrich, BTP student, and is interested in further externships and a possible site visit to BD facilities in Maryland. The study section concluded with discussion regarding the methods being pursued for increasing corporate support of externships and BTP Program in general.

My Externship Experience at MedImmune, Inc.

By Jace Fogle

IN FALL 2004, I WAS LUCKY enough to land an externship at MedImmune, Inc. in Gaithersburg, MD. As a Ph.D. candidate in chemical engineering, I wanted to gain experience in biopharmaceutical purification process design. I also hoped to work at a mid- to large-sized company where I'd have the chance to meet engineers and scientists from many different backgrounds. Further, I needed to find a company that was open-minded enough to hire a 27-year-old "extern" for three months. I am happy to say that MedImmune fulfilled these criteria, and then some.

MedImmune's research and development groups work out of the corporate headquarters site in Gaithersburg, MD. Located about 10 miles outside the D.C. Beltway, this ultra-modern, state-of-the-art facility was an exciting place to work. Here, I saw employees at every level on the corporate ladder make decisions and provide technical support for MedImmune's four FDA-licensed products: Synagis®, FluMist®, Ethylol®, and CytoGAM®. Synagis® is a recombinant monoclonal antibody for respiratory syncytial virus in premature infants. FluMist® is a live, attenuated flu virus vaccine which is administered via inhalation. Ethylol® is a small-molecule oncology drug to combat the side effects of conventional chemotherapy, and CytoGAM® is an antibody molecule used to prevent cytomegalovirus infection in immunocompromised individuals. These products are manufactured at production see MEDIMAINE, page 5
Merck Tour, A Unique Pharmaceutical Facility

By Elizabeth Phan

A SCENIC 1-HOUR DRIVE from Charlottesville to Elkton, VA brought the UVa Biotechnology Training Program PhD students out to the Merck Stonewall plant, a unique facility because it is the only domestic plant that handles both bulk chemicals and finished pharmaceutical operations. The BTP is an interdisciplinary training program that brings together students from across diverse fields such as genomics, bioprocessing, and cell and tissue engineering with the goal of preparing a new generation of scientists capable of incorporating these different disciplines towards exciting technological discoveries. On August 25, fifteen trainees along with BTP program director, Dr. Gordon Laurie, Bobbe Nixon, Director of Internships and Corporate Outreach for BME, and Joe Schmidt, Corporate and Foundation Relations for the UVa Health System, met with Merck's Dr. Robert Stieber and Dr. Terry Hudson to discuss and see first-hand the Technical Operations side of Merck. When a new drug is ready for production, Tech Ops is the essential bridge between research, quality, and manufacturing. Engineers and scientists of Tech Ops work closely to optimize, implement and transfer the new technology into existing manufacturing operations at Merck. The tour encompassed various aspects of the facility and ranged from the laboratory-scale, to the pilot units, and finally to the full-scale fermentation operations. Students were able to get up-close and view currently running processes that produced drugs such as the antiparasitic Avermectin and cholesterol reducing Lovastatin.

http://www.merck.com/careers/stonewalltech_ops.html

Va Biotechnology Research Park Tour

By Brian Schmidt

ABOUT THIRTY STUDENTS FROM THE BIOTECHNOLOGY Training Program and the Biomedical Engineering Society visited the Virginia Biotechnology Research Park in Richmond. The park employs over 1,300 engineers and scientists and assists new companies in their development, helping start-ups to develop business plans and obtain regulatory approvals. The group consisted of both undergraduates and graduates with varying goals: some wanted to investigate internship opportunities, some wanted to learn more about what opportunities there are for a full time position in Virginia, and others were just curious about industry and wanted to learn more about new commercial technologies.

The roundtable discussion included industry representatives with a diverse background. Martin Lenzhardt, the president of Ceres Biotechnology, told us about his company's device that delivers ultrasound echoes to the body, enabling blind babies to sense objects near them. He also discussed the development of a device that aims microwaves at the vestibule, essentially a nonlethal "dizzy beam" that could be an alternative to Tasers for police. Several young engineers from Nanomatrix talked about their nano-scale cellular scaffolds being developed for tissue engineering applications, their impressions of working for a smaller company, and how they liked working in Richmond. Dan Grinnan of the Virginia Division of Forensic Science discussed opportunities available with the state as a forensic scientist. Jack Brown of Boehringer Ingelheim discussed some of the technologies his company was developing and described how a large company was able to utilize some of the resources available through the park. Anthony Guiseppi-Elie, President of Abbott Scientific, Inc., discussed a clinical diagnostic his company was developing to help doctors rapidly determine how patients metabolize Prozac. Marc Licata of BioTrack discussed the support the park provides for its tenants. Representatives from Inamed, a company developing new therapeutics based on recombinant insulin-like growth factor, and Castle Technologies, Inc., which develops software applications for healthcare informatics, were also present. The trip ended in a tour of

see TOUR, page 6
sites in Pennsylvania, Kentucky, California, the United Kingdom, and the Netherlands.) While I did not travel to any of the production facilities, I did see pilot-scale equipment for production of molecules in clinical trials. (MedImmune has more than a dozen drug candidates being tested for efficacy against various infectious diseases and cancers.) On the weekends, I was able to ride the Metro into Washington, D.C. and explore the White House and Smithsonian museums.

While the research I conducted at MedImmune was confidential and will not be incorporated into my Ph.D. thesis, it did help me understand the relevance of my work here at UVa. The molecule I worked with is intended to treat Non-Hodgkin’s Lymphoma, which is cancer of the B cells. The goal of my project was to evaluate the suitability of a commercially available ion-exchange resin for use with this molecule. After running many, many bench-scale purification experiments and assays, I began to appreciate the need for rigorous guidelines that predict optimal resin types and buffer conditions based on specific structural information about the molecule being purified. This is precisely the goal of my work with Professor Erik Fernandez—to correlate protein stability on hydrophobic interaction chromatography media with protein structure and adsorption strength. If this project goes well, it will provide process design engineers with a design tool that could save countless scouting experiments at the bench scale. Eventually, I would like to publish my results so they can be put to good use at MedImmune.

University of Virginia Summer Research Internship Program

By Leslie Fox

In the summer of 1992, the University of Virginia School of Medicine established the Summer Research Internship Program (SRIP) under the leadership of Dr. Gary Owens. Dr. Joel E. Hockensmith, Assistant Dean for Graduate Research and Training, serves as chair of the Admissions Committee of faculty and graduate students, and oversees the applicant selection process.

The goal of the program is to expose undergraduate students to state of the art biomedical research and to familiarize them with the opportunities that exist for careers in biomedical research. The program runs for 10 weeks in the summer and includes three major components.

The first component is a hands-on research project with a faculty member where the student is exposed to contemporary methods and problems in biomedical research.

Next, there is a series of workshops explaining a variety of advanced research techniques that students are unlikely to see in individual laboratories. This includes tours and demonstrations of core research facilities at the University. Past workshops have included: use of transmission and scanning electron microscopy; generation of transgenic mice; mass spectrometric determination of protein mass and amino acid sequence; control of microcirculatory blood flow and how this is altered in disease states such as sickle cell anemia; oocyte expression cloning; and use of the fluorescence activated cell sorter.

Finally, the third component includes a Distinguished Lecturer Series presenting a wide variety of research topics through seminars given by internationally recognized scientists.

The culmination of SRIP is a 15–20 minute oral research presentation accompanied by a PowerPoint display by each student to the entire group, as well as, to any faculty mentors or colleagues that wish to attend.

SRIP has had a positive impact on the students that have participated in the program, with many of them either applying for or matriculating in medical school or graduate school. Over the last few years, we have had 20% of our SRIP students applying to our Biomedical Science graduate programs and approximately half of them have matriculated at the University of Virginia.

For more information visit http://www.med.virginia.edu/srip/.
Welcome to New BTP Trainees

By Dr. Gordon Laurie

A WARM WELCOME AND CONGRATULATIONS TO

Alexander Baras, Emily Cushnie, Erwin Gianchandani, Olugbemisola Oredin, Timothy Pabst, Caren Petrie, and Meng Wang on their acceptance into the Biotechnology Training Program (BTP). Alexander is a PhD student in new BTP mentor Christopher Moskaluk’s lab (Pathology) and is a 2003 graduate of Georgetown University (Biology BS). Emily comes from Villanova University where she recently (2003) graduated with a BE in Chemical Engineering/Chemistry. Emily is in the Laurenca lab. Erwin is a new UVa grad (2005) with a BS in Computer Science and minor in Biomedical Engineering. Erwin is in the lab of new BTP mentor Jason Papin (BME). Olugbemisola is another UVa grad (2004) with a BS in BME. She is a Laurenca lab mate of Emily. Timothy received his BS in Chemical Engineering/Biochemical Engineering in 2003 from Michigan State University and is in the Carta lab in Chemical Engineering. Caren is a record third UVa grad (Chem. Eng., ’03) and is training in new BTP mentor Edward Botches’ lab (BME). Meng received her BS degree in 2004 from Zhejiang University, and is currently in Roseanne Ford’s lab in Chemical Engineering.

Tour, from page 4

the Biotech One and the Biotech Center buildings.

All of my fellow students I was able to question after the trip shared my positive impression. I believe the site visit was so exciting because of the diversity of the technologies presented, from recombinant therapeutics to tissue engineering to electronic design. There was an obvious catch for anyone whether they came from background with more of a mechanical, electrical, chemical, or biology focus, but the discussion was at a nontechnical level so it was possible to probe the applications not directly related to one’s thesis work. It was also ideal that we were able to sample the medical equipment, pharmaceutical, and biotechnology industries in a single visit.

I wanted to thank Joe Schmidt, Nicole Colamb, Leslie Fox, and our BMES officers for all of the work they put into organizing the visit.

BTP Minority Day

By Gary Davis

ON FEBRUARY 2, 2005 the Biotechnology Training Program held its second ever Minority Day. Minority students from Norfolk State University (NSU) and Virginia Union University (VUU) in several different disciplines in the biotechnology field came to the University to hear about the research and other opportunities here at the University of Virginia. The students were accompanied by Dr. Joseph Hall, Professor of Chemistry at NSU and Dr. Sayamal Premaratne, Assistant Professor of Biology at VUU. The agenda for the day included tours of University facilities and a dinner in which we entertained a stimulating discussion on what it takes to get into grad school, and what it is like to be a PhD student. Leading the discussion was Gary Davis and Clinton Copeland. BTP students spoke about corporate externships. Keynote talks were given by Dave Patteson and Bob McKown. Dave Patteson is the President of BiotaGe and he serves on the BTP Board of Corporate Advisors. Dave spoke about unique opportunities in the field of biotechnology. Bob McKown is a professor at James Madison University and also a member of the BTP Board of Corporate Advisors. Bob provided a unique historical perspective on the evolution of the Biotech industry—including its genesis over two mugs of beer.
2004 Virginia Biotechnology Educator of the Year

By Robert McKown, Ph.D.

The Virginia Biotechnology Association (VaBio) recognized Dr. Gordon W. Laurie as the 2004 Virginia Biotechnology Educator of the Year at the Association's annual Awards Banquet on October 12, 2004. VaBio was incorporated in the Commonwealth of Virginia in 1992 as a non-profit association to promote the biotechnology industry in Virginia. The Association recognized early on that academia plays a critical role in not only scientific discovery that fuels the industry, but also in training a skilled workforce and preparing the next generation of research scientists. At the 2000 summit, VaBio initiated the Virginia Biotechnology Educator of the Year Award as a way of recognizing outstanding accomplishments of educators that have positively impacted the biotechnology industry in the Commonwealth.

This year, Dr. Gordon Laurie was presented the award in recognition for his accomplishments in mentoring scientific research and directing a unique graduate level Biotechnology Training Program. He was also recognized for his entrepreneurship in the discovery and development of a new biotech therapeutic product.

Following a Postdoctoral Fellowship at the National Institutes of Health, Dr. Laurie accepted a faculty position in the Department of Cell Biology at the University of Virginia and set up a research laboratory with a focus on the differentiation and regulation of exocrine secretion. His lab was the first to identify a short morphogenic site in the laminin-1 alpha chain as a key promoter of alveolar formation via its cell adhesion, cell migration and MMP9 triggering activity. Using secretion assays, the lab was also first to uncover a basement membrane activity whose synergy with laminin-1 is required for differentiation of the regulated secretory pathway. Most recently, the Laurie group discovered and cloned a novel secretion enhancing factor from the human lacrimal gland termed "lacrini" that has been shown to promote cell proliferation and survival. In the course of this work, Dr. Laurie has mentored 10 Postdoctoral Fellows in his lab and trained over 35 undergraduate and graduate students. He is currently the Admissions Chair for the UVa Cell and Developmental Biology Graduate Program.

In May of 2000, Dr. Laurie was awarded an NIH grant as PI, and became Director of the Biotechnology Training Program (BTP) at UVa. This unique Ph.D. graduate program not only maintains high standards for training students to do the best possible science in an interdisciplinary setting, but also integrates the opportunity to experience industrial science. The challenge in developing new training programs in biotechnology is to find the correct balance between basic research and the application of this research to develop a market product. Dr. Laurie has found this balance in the BTP and in his laboratory. He has discovered and has been awarded a patent on a human protein that has potential as a new therapeutic for the treatment of Dry Eye Syndrome.

In the course of this work, Dr. Laurie has mentored 10 Postdoctoral Fellows in his lab and trained over 35 undergraduate and graduate students.
The Faculty & Their Research

Gary Balkai—(C&EMC) Biochemistry of connective tissue macromolecules.

Travis Blaok—(EE) CMOS digital and analog signal processor design.

Edward Botchway—(BME) Development of new cell material systems for bone tissue engineering.

David Brautigan—(M) phosphates and cell signaling circuits.


Giorgio Carta—(CE) Adsorption and ion exchange, chromatography, bioanalysis.

Zygmunt Derewenda—(MPBP) Protein structure and function: macromolecular crystallography; mechanisms of signaling by GTPases; protein-protein interactions.

Douglas Desimone—(C8) Cell adhesion molecules in development.

Brian Duling—(MPBP&BME) Cell-cell communication in the vesal wall, including chemical, electrical, and mechanical processes that lead to coordination function of endothelial and smooth muscle cells.

Victor Engelhard—(M) Structure and synthesis of antigens recognized by T lymphocytes; tumor immunology.

Erik Fernandez—(CE) Purification of biological molecules, protein structure, magnetic resonance imaging and spectroscopy.

Roseanne Ford—(CB) Environmental remediation, microbial transport in porous media.

Cassandra Fraser—(C) Polymeric metal complexes: synthesis, properties and uses.

Jay Fox—(M) Basement membrane structure and metalloproteinases.

H. Mario Geysen—(C) Combinatorial Chemistry.

Stephanie Guerlain—(SE) Information system development in the human genome era.

Bill Guilford—(BME) Vascular and molecular engineering.

Brian Hemke—(BME) Endothelial mechanotransduction, cellular biomechanics, nanotechnology tools for cellular bioengineering, cell-cell interactions in microcirculatory blood flow.

John Herr—(C8) Differentiation antigens expressed during mammalian spermatogenesis.

Rick Horwitz—(CB) Cell adhesion in development and pathology.

Donald Hunt—(C8) Protein sequencing by mass spectroscopy.

Issa Hussaini—(P&NS) Functional roles of low density lipoprotein receptor-related protein (LRP) and protein kinase C in astrocytic tumor invasive growth.

Donald Kirwan—(CE) Mass transfer and separation, crystallization, biochemical engineering.

James Landers—(C8) Biological, biochemical and clinical chemistry.

Gordon Laurie—(CB) Molecular control of epithelial differentiation.

Cato Laurencin—(O, BME, and CE) Biomaterials, tissue engineering, drug delivery and nanotechnology

Michael Lawrence—(BME) Biochemical, cellular, and mechanical factors regulating leukocyte adhesion.

Klaus Ley—(BME&MPBP) Molecular mechanisms of leukocyte adhesion and genetic engineering targeting atherosclerosis.

Timothy MacDonald—(C) Biologic and synthetic organic chemistry.

Christopher Moskaluk—(P) Genetic and genomic analysis of human cancers.

Pamela Norris—(MANE) Aerial technology.


J. Thomas Parsons—(M) Protein kinases in cell adhesion.

William Pearson—(BME) Protein evolution; transcription.

Ian Sarembock—(NS&ES) Role of inflammation in vascular injury and repair.

Thomas Skalak—(BME) Cardiovascular mechanics, microcirculation.

Ann Sutherland—(CB) Cell matrix interactions in mouse development.

Ronald Taylor—(BME) Clearance of pathogens.

Martin Schwartz—(M) Integrin signaling and its relevance to mechanotransduction, cancer and vascular disease.

Judith White—(CBM) Molecular mechanisms of viral and cellular adhesion/fusion proteins; molecular mechanisms of sperm-egg binding and fusion: ADAMS in fertilization and development.

Michael Wormington—(B) Post-transcriptional regulation of gene expression; Development of RNA-based therapeutics.

*Program Director