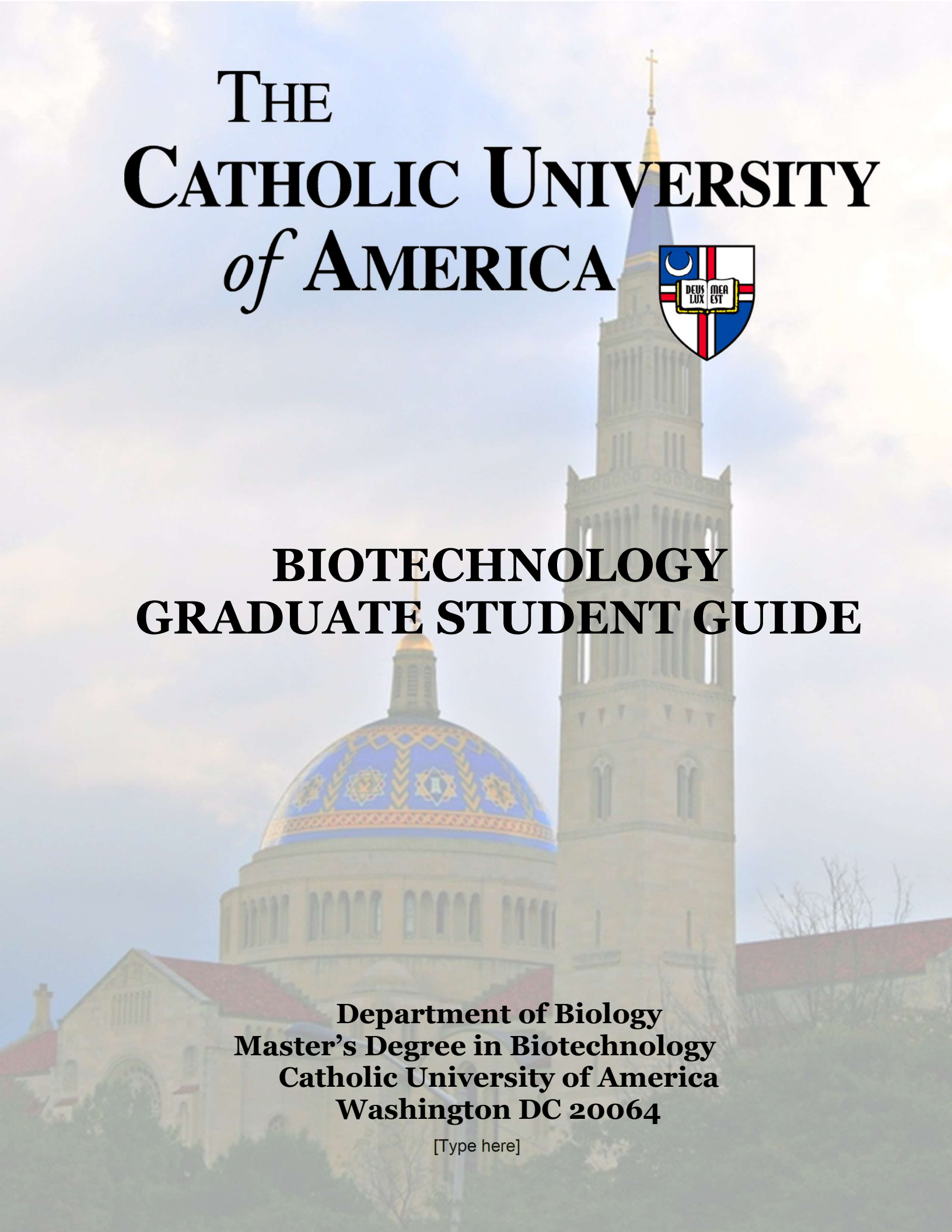

THE CATHOLIC UNIVERSITY of AMERICA

BIOTECHNOLOGY GRADUATE STUDENT GUIDE

Department of Biology
Master's Degree in Biotechnology
Catholic University of America
Washington DC 20064

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GENERAL INFORMATION

The University

The Catholic University of America is located in the northeast quadrant of Washington D.C., approximately three miles from the Capital. Founded in 1889 as a research-oriented institution, The Catholic University is comprised of ten schools and currently has an enrollment of about seven thousand students, more than half of which are graduate students. The Catholic University is among the founding schools of the Association of American Universities and is one of the original sponsors of Oak Ridge Associated Universities, a nonprofit research management corporation of forty-nine universities fostering research in energy, health, and the environment.

The Department of Biology

Biology is one of seventeen departments in the School of Arts and Sciences. The Department offers the degrees of Master of Science and Doctor of Philosophy in Cell and Microbial Biology, Master of Science in Biotechnology, and Master of Science and Doctor of Science in Clinical Laboratory Science. Dual degree programs, which enable students to earn a Bachelor's degree in biology and a Master's degree in either biology or biotechnology, is also an option. In addition, the Department of Biology offers a joint master's program with the School of Library and Information Science in which students complete a total of sixty semester hours and receive both a master's degree in Cellular and Microbial Biology and a master's degree in Information Science. The programs in biology are described in detail in the following pages of this guide. A newly formed Bacteriophage Medical Research Center, by its unique missions, will broaden the research opportunities for graduate students in the Department.

The Chair of the Department of Biology

Dr. Pamela Tuma is the Chair of the Department. As Chair, she is responsible for the administration of the Department. The Chair she also represents the interests of biology faculty, students, and staff to the University's administration. Student business requiring the approval of the entire faculty such as approval to take certain courses outside of the department, approval to transfer credits, etc., must be originated by either the student or the student's advisor and must be processed through the office of the Chair. Prior to originating a request for faculty action, the student should first consult his/her advisor. The advisor for biotechnology students is the Program Director, Dr. Frank Portugal.

The Assistant to the Chair

Ms. Marion B. Ficke is a member of the faculty of biology and also serves as assistant to the Chair. In this capacity, she coordinates the premedical program for undergraduates and the scheduling of courses and teaching assistants. Moreover, together with the department Chair, she oversees the general progress of graduate students. Ms. Ficke can also be consulted when students need to register for courses.

The Office Manager for Biology

Mr. Wavell Pereira assists in the functioning of the department's office. In particular, he maintains the department budget, registration information, department graduate student records, as well as department personnel files. He also purchases lab equipment and supplies originating from the department and some individual faculty members.

Biotechnology Program Director

Dr. Frank Portugal is the biotechnology director and advises students on course registration, rules and procedures of the department and University, and the conduct of the research internships. Any questions regarding the department or university should first be directed to the director. If the question cannot be answered or a problem cannot be resolved satisfactorily,then the student should see the department Chair.

Selection of the Research Internship

The centerpiece of the biotechnology program is a research internship during the summer on a problem and location of the student's choice. Internships provide 4 academic credits toward the Master's degree. Students receiving credit for their internship are not permitted to aso accept a salary or other form of payment. Dr. Portugal meets with each student to discuss his or her interests and choices. Students can either choose laboratory research or training with a biotechnology-related association or government office. Dr. Portugal then requests a copy of each student's resume, reviews it and, if necessary, suggests changes. Dr. Portugal then seeks out a laboratory or office that matches each student's preferred choice and submits the student's resume. If the Principal Investigator or office supervisor agrees to consider that student, Dr. Portugal provides him or her with information about the laboratory or association and the contact information for the Principal Investigator or supervisor. The student then initiates an appointment to discuss the internship with the Principal Investigator or supervisor to secure the internship.

The internships are usually done during the summer when students are not engaged in classes and laboratory or office staff may be depleted as staff go on vacations. Interns must work a minimum total of 320 hours, which can be done full-time for eight weeks or part-time for 16 weeks. Students register for Biol 695 (Internship) the semester ***after*** completing the internship. This enables the student to write a 15-20 page report on their research or office activities. The introductory material of the report reviews the laboratory or office and the key, relevant personnel. The end of the report is a summary of the student's view of the internship and suggestions, if any, for making it an even better experience for the next intern. In addition, the mentor is sent a three-page form with which to evaluate the intern. The internship is graded based on both the student's report and mentor's evaluation.

Obtaining Desk space and Establishing a "Home" in the Department

Desk space is available in the student lounge located on the second floor of the McCort-Ward (Biology) building in room 207. Access to this room is by keyless entry. The code can be obtained from the Program Director, Dr. Portugal.

Additional “quiet” space is available in room 150 located in the corridor between the McCort-Ward (Biology) building and Gavin Hall (Nursing) in room 150. Access to this room is also by keyless entry. The code can be obtained from the Program Director, Dr. Portugal.

IMPORTANT TELEPHONE NUMBERS AND ROOM ASSIGNMENTS FOR FACULTY

Name	Office		CUA Extension
Dr. John Choy	106/107	MCW	5278
Dr. Ann Corsi	206	MCW	5274
Ms. Marion B. Ficke	212	MCW	5870
Dr. Ekaterina M. Nestorovich	263	MCW	6723
Dr. Franklin Portugal	G1	MCW	5653
Dr. Venigalla B. Rao	306	MCW	5271
Dr. Pamela Tuma	260A	NB	6681

DEPARTMENT OFFICES

Name	Office		CUA Extension
Mr. Wavell Pereira	104	MCW	5267
Dr. Thuan Trinh	110	MCW	5269

FACULTY RESEARCH AND PROFESSIONAL INTERESTS

John S. Choy
Associate Professor
Ph.D. – University of Chicago

Using the budding yeast, *S. cerevisiae*, as a model system, my laboratory studies several areas of research related to genome stability and plasticity: (1) Elucidating the mechanism(s) responsible for integrating nutrient signals with chromosome segregation and the DNA damage response (DDR), (2) Mapping complex haploinsufficient interactions that lead to chromosome instability, (3) Investigating how genome instability is linked to the mechanism of neurodegeneration in Huntington's disease, and (4) Developing single cell technologies to study the aging process. We apply and develop genome-scale and single cell resolution tools with the aim of building a comprehensive understanding of metabolic signaling and itsconnection to chromosome structure and function, particularly within the context of genomemaintenance and the etiology of disease.

(1) Nutrient availability is an important factor in tumorigenesis and in maintenance of healthy tissue. Notably, cancer cells are known to harbor mutations in genes that serve important roles in nutrient signaling and as early as the 1930's Otto Warburg provided evidence that cancers have a unique metabolic program that differs profoundly from normal cells. Key nutrients such as glucose, amino acids, phosphate, and ammonium can activate signaling cascades resulting in significant changes in the transcriptome that modulate cellular physiology and the decision to enter or exit the cell division cycle. The Ras/Protein kinase A (PKA) signaling pathway is a key regulator that senses intra- and extracellular glucose and transduces signals to activate or inhibit cell growth in both yeast and human cells. We previously discovered that cells with deregulated PKA activity has greater than a 20-fold increase in the rate of chromosome loss compared to wild-type cells. We are currently using targeted and genome-scale genetics and molecular approaches to elucidate the mechanism by which PKA signaling can modulate chromosome segregation fidelity. We also have a very limited understanding of how metabolic signaling impacts the DDR, which ultimately can lead to changes in the integrity of the genome. In particular, glucose deprivation can occur when blood supply to cells become restricted as is the case in tissue ischemia and in solid tumors, where rapidly proliferating cells compete for limited glucose and oxygen. Toward investigating how metabolic signaling is integrated with the DDR we are (1) using genome-scale genetics in the model system, *S. cerevisiae*, to explore if different nutrient conditions lead to "rewiring" of the network of pathways required for a proper DDR and (2) dissecting the changes in protein-protein interactions essential for the DDR under specific nutrient conditions.

(2) Copy number variation (CNV) and aneuploidy are common features of cancer. In particular, recurrent hemizygous focal deletions are observed in several cancer types and the vast majority does not harbor tumor suppressor genes. This raises the possibility that these regions carry haploinsufficient genes that contribute to tumorigenesis. In addition, many of the same cancers are also aneuploid, yet the mechanism of aneuploid formation is unclear. This motivates the following question: Might there be haploinsufficient genes that predispose cells to chromosome missegregation leading to aneuploidy? Toward this end, we developed a method to perform genome-wide screens to identify haploinsufficient mutations that cause chromosome instability in *S. cerevisiae*. The genes revealed from this work point to a variety of biological processes that impact genome stability. Notably, this work uncovered a new link between metabolic signaling and chromosome stability and a novel function for gamma-tubulin in controlling spindle assembly during chromosome

segregation. Based on this work, we are now (1) investigating mechanisms of how altered gene dosage of metabolic signaling genes can cause chromosome instability and (2) constructing a comprehensive haploinsufficiency genetic map of metabolic pathways used to maintain genome stability by studying epistasis of haploinsufficient mutants.

(3) Huntington's disease is the most frequently inherited neurodegenerative disease that is associated with the loss of cortical and striatal neurons that are found in the brain. Typically individuals show symptoms such as a loss in motor coordination, and higher order cognitive abilities such as reasoning and thinking, which begin between the ages of 30-50, and progressively worsen over the course of 10-25 years. Presently there is no cure, however, it is well established that an expanded glutamine repeat in the huntingtin (HTT) gene is known to cause the disease. The mutant HTT protein is known to form aggregates in human neurons and it is thought that the aggregates lead to neuronal cell death, yet we still lack a clear mechanism of how these aggregates function. Expression of the first exon of HTT with the expanded glutamine repeats are also known to form aggregates in yeast and also causes a loss in viability. The mutant HTT aggregates are thought to cause protein stress and several groups have mapped out a large number of genetic interactions suggesting that HTT aggregates affect numerous processes, including the formation of reactive oxygen species. We have found that mutant HTT modulates genome stability and working to understand the mechanism of action. We are also investigating similar possibilities with other neurodegenerative diseases that are associated with proteinopathies.

(4) Aging has been described as the greatest carcinogen. It is well established that as cells age, the frequency of mutation increases. In yeast, it is known that nearing the last quarter of their life span there is a significant increase in loss of heterozygosity, demonstrating that as part of the aging process the genome becomes less stable. The mechanisms are not yet fully established and we still do not have a clear understanding of all the physiological changes that occur as a result of aging. My laboratory in collaboration with Dr. Xiaolong Luo in the Department of Mechanical Engineering at Catholic University are developing microfluidic platforms coupled with fluorescence microscopy to allow us to (1) investigate the changes in cell cycle kinetics and (2) monitor changes in the DDR, all as a function of age and at single cell resolution.

Ann Corsi
Ordinary Professor
Ph.D. – University of California, Berkeley

Our research is aimed at understanding the basic question in developmental biology: "During development, how does a cell's fate become specified?" Or, more simply, how does a cell know to become a muscle cell and not a nerve cell or some other type of cell? Specific proteins contribute to a cell's fate, and regulators called transcription factors control the presence of these proteins. A careful examination of how transcription factors perform their function, therefore, will be critical for understanding cell-fate specification. We are studying cell-fate specification in the context of transcriptional regulation in the mesoderm. The mesoderm is the middle embryonic germ layer from which muscle, connective, and heart tissues are derived. The model organism that we use is the nonparasitic soil nematode, *Caenorhabditis elegans*. *C. elegans* have a number of advantages for studying development such as transparent cells, complete genome information, and powerful genetics. Theanimals also have a short generation time of 3 days allowing rapid experimentation. In addition, the nematodes have several tissue types that are mesodermal in origin and yet a

small total number of mesodermal cells so that we can focus on events at a single cell level.

A number of transcription factors play a role in cell-fate specification. We are focusing on a basic helix-loop-helix (bHLH) transcription factor CeTwist, which plays a role in patterning and specification of the mesoderm in *C. elegans.* Our aim is to understand the mechanism by which this factor controls the expression of target genes in a diverse set of mesodermal cells. CeTwist forms heterodimers with another bHLH factor, CeE/DA. As first step towards our aim, we have identified target genes of the heterodimers using microarrays representing all of the transcripts in the *C. elegans* genome (Wang et al., 2006). We have also explored the mechanism of regulation of one of the target genes, *arg-1* (Zhao et al., 2007). In the promoter region of *arg-1*, we have found three elements that are uniquely required for the expression pattern of *arg-1*. Currently, we are pursuing various lines of investigation to understand how these elements are uniquely used by the bHLH factors for regulating transcription in individual cells. Furthermore, we have identified a role for CeTwist containing homodimers (manuscript in preparation) and are using a microarray approach to identify target genes of the homodimers. Finally, in order to understand the temporal and spatial regulation of the CeTwist and CeE/DA genes, we are using a reporter gene approach to identify elements important for their expression. Collectively, we expect our multifaceted approaches will provide a mechanistic understanding of target gene control by bHLH factors in mesoderm development.

Our work has important human health consequences. Mutations in the human Twist gene are associated with a developmental disorder called Saethre-Chotzen syndrome in which patients have craniofacial and digit defects. Mutations in human homologs of several CeTwist target genes, including *arg-1,* are associated with other human syndromes causing defects similar to those seen in Saethre-Chotzen patients, and similar diseases exist whose underlying genetic basis is not yet known. Thus, *C. elegans* genes identified by the genetic and molecular approaches in our laboratory will reveal candidates for defective human genes in individuals suffering from related developmental syndromes. We have already found several candidate genes and expect that a careful understanding of their regulation will help us to understand more about craniofacial diseases in humans.

Marion B. Ficke
Assistant to the Chairman and Pre-Medical Coordinator
M.S. - The Catholic University of America

Clinical microbiology, particularly diagnostic *bacteriology, is my area of professional interest. I maintain a position as a clinical microbiologist at Holy Cross Hospital.
In the Department of Biology, I teach courses in general and pathogenic microbiology. Academic advising, premedical advising, and coordinating teaching assistants' assignments are among the administrative responsibilities of the Assistant to the Chairman.

Ekaterina M. Nestorovich
Associate Professor
Ph.D.- St. Petersburg State University, St. Petersburg, Russia

Biological nanosensors: ion-channel engineering to solve medical problems.

Ekaterina M. Nestorovich earned her Ph.D. in electrochemistry from St. Petersburg State University, Russia under supervision of Prof. Valery Malev. She performed a postdoctoral research in biophysics with Dr. Sergey Bezrukov at the National Institutes of Health. While at the NIH, she mastered the art of ion channel reconstitution into planar lipid bilayers (the models of biological membranes) and modern methods of statistical analysis of ionic currents – powerful tools which allowed her to study kinetic and transport properties of channel-forming proteins at the single-molecule level.

From the biomedical science perspective, she searches for novel effective approaches to make good use of ion-conducting nanostructures in a variety of medical, chemical, and biotechnological applications. From the biophysical perspective, she pursues a new level ofunderstanding of biological structures through the physical forces that animate them. By learning the physics and chemistry of biological structures' functioning, Dr. Nestorovich strives to determine how to design new agents that effectively correct the deviantinteractions associated with diseases.

Franklin Portugal
Clinical Associate Professor
Director, M.S. in Biotechnology
Ph.D. – University of Illinois, Chicago

Our laboratory focuses on bacterial pathogenesis of both Gram-positive organisms, such as *Staphylococcus aureus* and *Streptococcus pneumonia*, as well as Gram negative organisms including *Escherichia coli* O157:H7 and *Pseudomonas aeruginosa*. We use mass spectroscopy to determine metabolites released by bacterial pathogens during grow that enable these pathogens to invade and infect eukaryotic systems. We then determine how these released metabolites affect growth, replication and metabolism of eukaryotic cells. Experiments involve exposing eukaryotic cells to various bacterial metabolites to determine where and how they interfere with eukaryotic cell function.

We are also investigating the roles of certain metabolic pathways that enhance bacterial pathogenicity. The metabolism of one amino acid, for example, appears to play a key role in regulating bacterial pathogenesis of *S. aureus*. The purpose of our research is to determine how it may be possible to disrupt bacterial pathogenicity without the use of antibiotics. This is of importance given that resistance to antibiotics has become an increasingly serious problem not only in the United States but globally as well.

Venigalla B. Rao
Professor
Ph.D. - Indian Institute of Science

DNA packaging in Viruses

Organized packing of nucleic acids in biological systems is a fascinating phenomenon. We use bacteriophage T4 as a model system to elucidate the mechanism of DNA packaging in double stranded DNA containing icosahedral viruses. DNA packaging occurs by translocation of DNA into a preformed capsid shell and its organization into a condensed structure.

Phage DNA packaging is also an excellent model system to understand the mechanisms of DNA condensation in biological systems and a paradigm for molecular analysis of the fascinating molecular motors.

We employ a combination of molecular genetic, recombinant DNA, and biochemical approaches to elucidate the mechanisms of DNA packaging. It is believed that a complex packaging machine assembled at the unique portal vertex of the coat structure drives DNA translocation utilizing ATP hydrolysis as the energy source. The principal components of the pump, the gene products 16 and 17, have been cloned, overexpressed, and purified. We have developed a powerful combinatorial mutagenesis paradigm and mapped a DNA translocating ATPase site in gp17. Biochemical characterization of the gp16-gp17 complex

and molecular understanding of the linkage between ATP hydrolysis and DNA movement are the principal projects in the lab. Extensive biochemical and molecular genetic analyses of the translocating ATPase are underway with the intent to generate a 3D-molecular structure for the phage T4 packaging machine.

Bacteriophage T4 for multicomponent display and vaccine development

We have developed novel strategies to use phage T4 for display of multiple vaccine epitopes on T4 capsid surface. The DNA fragments corresponding to the vaccine epitopes are fused in-frame to the two non-essential outer capsid proteins Hoc (highly antigenic outer capsid protein) and Soc (small outer capsid protein). The fusion proteins, under appropriate genetic backgrounds, are assembled onto the Hoc- Soc- capsids. These recombinant phage displaying foreign epitopes are used as potential vaccines for elicitation of protective immune responses. This system is currently being developed to construct efficacious multicomponent vaccines HIV and anthrax

Structural analysis of phage T4 assembly pathway

In collaboration with Dr. Alasdair Steven's group, Lab of Structural Biology, NIAMS, NIH, we have performed Cryo-electron microscopy and generated 3D-image reconstructions of a number of intermediates in the phage T4 assembly pathway. One of the goals of this project is to analyze the profound structural transitions that occur during the morphogenesis of a complex icosahedral capsid. Ultimately, we would like to perform structural analysis of the DNA packaging pump associated with the prohead shell.

Pamela L. Tuma, Professor and Chair
PhD: Northwestern University Medical School

My lab investigates membrane dynamics in polarized epithelial cells. Epithelial cells are vital for the success of multicellular organisms. They line all organs of the body and providea selective barrier between the external and internal worlds. Intercellular junctions establishthis barrier by cementing the cells together, thus restricting distinct cellular activities to eitherthe apical or basolateral plasma membrane (PM) domain. Such functional asymmetry (or polarity) reflects the differential distribution of PM proteins in the two domains. How is polarityestablished and maintained? How does polarity vary in response to physiological changes, during development or among different cell types? We believe that answers to these fundamental questions come, in part, from understanding membrane trafficking in polarizedepithelial cells. Our long-term goal is to understand the mechanisms regulating apical membrane dynamics in polarized hepatocytes. The hepatic apical PM faces the bile and is specialized to communicate with the external world, yet protect the cell from this harsh environment. How are the apical proteins required for these and other specialized tasks specifically targeted to the apical surface? How are they retained? Are unique molecules required? How are these processes perturbed in cancerous cells that are characterized by a loss of cell polarity?

Our studies in understanding apical vesicle targeting are focused on investigating the function of Munc 18-2. The Munc18 proteins have been identified as key players in vesicle targeting and fusion. Munc18-2 is an epithelial-specific isoform and is peripherally associated with the hepatic apical PM. This subcellular location and restricted expression pattern suggest a unique function for Munc18-2 in regulation of apical vesicle delivery. We are examining this possibility using morphological, biochemical and molecular approaches.We have also initiated studies to examine the retention of apical resident proteins at the apical PM. An emerging hypothesis proposes that domain-specific proteins maintain their

polarized distributions by actin-based scaffolds that actively exclude them from endocytosis. We are examining this hypothesis in polarized hepatocytes using similar approaches.

M.S. PROGRAM IN BIOTECHNOLOGY

The Dual Degree (4 + 1) Program

The M.S. in Biotechnology Program offers undergraduates majoring in biology, chemistry, biomedical engineering, or neuroscience with a 3.5 GPA or higher the opportunity to elect in the first semester of their junior year the 4 + 1 program. In five years, rather than 6 years, the candidate will have earned both a B.S. in their major and an M.S. in biotechnology.

Grade Requirements

In order to receive the M.S. degree, the student must have a minimum of a 3.0 average and no more than 6 credit hours of C grades. When a total of 3 credit hours of C grades are received or when the GPA in any given semester falls below the 3.0 the student will be considered marginal. If the GPA is below 3.0 for two consecutive semesters or more than 6 credit hours of C grades are received, the student is subject to dismissal. Students who receive one grade of F will also be subject to dismissal.

Residence Requirements

The minimum period of residence for the master's degree is one year of full-time residence (or the equivalent) beyond the bachelor's degree. A full-time student may not complete this requirement in less than two semesters or in less than one semester and two summer sessions. A part-time student may not complete this requirement in less than four semesters. Every graduate student is required to maintain continuous enrollment from the date of first registration until a degree program is completed, unless he or she is granted a leaveof absence.

Enrollment Consequences

Any student who fails to maintain continuous enrollment is presumed to have withdrawn from the University and must therefore petition for readmission. An applicant for readmission must pay the application fee.

Definitions of Leave of Absence and In Absentia

Leave of Absence:

Normally requires documentation of sustained ill health, required military service, or equally serious circumstances resulting in *involuntary* interruption of graduate studies. All requests for leave of absence must be approved in advance of the effective date by the department chairperson and dean.

M.S. DEGREE REQUIREMENTS CHECKLIST

Check	Item	Date Completed
☐	1. Core courses or equivalent (18 credits)	___/___/_____
☐	2. Specialty seminars (2 x 1 credit each/2 for Pass/Fail)	___/___/_____
☐	3. Elective courses (6 credits)	___/___/_____
☐	4. Internship (4 credits)	___/___/_____
☐	5. Application for graduation	___/___/_____

ACADEMIC PROGRAM

MASTER OF SCIENCE IN BIOTECHNOLOGY

The Catholic University of America offers the degree Master of Science in Biotechnology. The program normally covers four semesters with a summer internship experience (see Section XXX) between the first and second academic year. Students can also elect an accelerated program to be completed in just three semesters. Options after graduation include careers in either the science or business of biotechnology or further professional training in medicine, doctoral, dental or veterinary programs.

COURSE REQUIREMENTS

A minimum total of 30 credit hours are required for the completion of the degree.

	Core Courses:	Credit
1.	Principles and Practice of Biotechnology. Biol. 579 (*Fall)* Genetic engineering, genomics, proteomics, and metabolomics underlying biotechnology applications in all fields.	3
2.	Essential of Biotechnology Program Management. Biol. 581 (*Fall)* Combines project management theoretical methodologies and real-life examples including managing uncertainty, risks, and the future.	3
3.	Entrepreneurial Biotechnology. Biol. 580 (*Spring*)	3
4.	Regulation of Domestic and Global Biotechnology Products. Biol. 581 (*Spring*)	3
5.	Molecular Genetic and Recombinant DNA Methodology. Biol. 586 (*Fall*) Experimental approaches for the cloning, identification, and analysis of genes and gene expression.	3

6. Gene Organization and Expression. Biol. 538 (*Spring*) 3
Organization of prokaryotic and eukaryotic genomes; transcription and translation processes; nucleic acid biochemistry.

Elective Courses		Credit
BIOL 530	Molecular Techniques	3
BIOL 540	Mechanisms of Gene Mutation and Gene Transmission	3
BIOL 544	*Enzyme Catalysis, Regulation and Drug Targeting*	*3*
BIOL 554	*Biological Chemistry*	*3*
BIOL 555	*Rational Drug Design*	*3*
BIOL 559	*Cell Structure and Function*	*3*
BIOL 563	*Developmental Biology*	*3*
BIOL 565	*Model Organisms and Human Disease*	*3*
BIOL 572	*Genomics, Proteomics, and Personalized Medicine*	*3*
BIOL 574	*Viruses and Vaccines*	*3*
BIOL 584	*Mechanisms of Bacterial Pathogenesis*	*3*
BIOL 589	*Introduction to Nanobiotechnology*	*3*
BIOL 596	*Computational Genomics*	*3*
BIOL 597	*Fundamentals of Statistics in Biology, Medicine, and Biotechnology*	*3*
BIOL 598	*Membrane Trafficking and Disease*	*3*
BIOL 599	*Signal Transduction and Biomembranes*	*3*
BIOL 692	*Research Topics in Biology – Master's*	*2*
BIOL 693	*Research Problems in Biology – Master's*	*3*
BIOL 695	*Biotechnology Internship*	*4*
BIOL 698A	*Master's Comprehensive Examination (w/Classes)*	*0*
BIOL 698B	*Master's Comprehensive Examination (w/o Classes)*	*0*
		3

APPENDICES

APPENDIX A

Policy On
ACADEMIC HONESTY AND UNETHICAL PRACTICES

A student who is involved in unethical practices in connection with any work required for a course will receive a grade of **F** (Failure) for the course. Further penalties may be imposed in accordance with specific circumstances.

It is strictly prohibited, as an unethical practice, to submit as one's own work term papers, research, or professional papers in which material is provided by a professional research agency or by other persons is utilized. A graduate student who employs such assistance or other unethical practice in the research shall be liable to expulsion from the university upon proper hearing by the department or school and dean.

Note: The operative words in the preceding regulation are "as one's own work." Whether the material comes from a professional research agency or a ghost writer or is simply plagiarized, its submission as one's own work is unethical. On the other hand, if due acknowledgement is given, for example, to statistical or printed sources, the practical is ethical. It will then be for the faculty to judge, by way of existing process, whether there is sufficient original work to justify accepting the paper or dissertation.

Department of Biology's Definition of Plagiarism
The presenting of the writing of others as that of your own hand, is an extremely serious academic offense, and will not be tolerated. The actual writing of term papers or other assignments must be your own creation. Any use of the actual words of other authors must be minimal (*i.e.*, a few lines at most), surrounded by quotation marks, and clearly acknowledged with an appropriate reference to the original source of the material. Even the use of a single sentence from someone else's writing, without quotations and proper referencing, will constitute plagiarism. University policy now stipulates that any plagiarism on a piece of assigned work will result in the in the guilty party receiving an F grade for the course. If you have any doubts about what constitutes plagiarism, see your instructor for clarification

Unethical and Un-academic Practices in Graduate Research

At its meeting of February 17, 1981, the Graduate board approved for distribution to School and departments the following amplification and clarification of the University regulations concerning unethical and un-academic practices, with reference to graduate research.

It is understood that the guidelines below refer to assistance to graduate students from persons other than their faculty advisors. It is important,moreover, that the approval given for legitimate assistance in the "gray" area referred to below should be in writing so that it will be available to other members of the faculty who may reviewthe work of the student.

I. Prohibited utilization of professional assistance in the preparation of term papers refers not only to the writing of such papers but also to the design and execution of the work on which the writing is based.

II. The regulation clearly is *not* intended to exclude any routine assistance that is strictly technical, mechanical or clerical, i.e., that is *subsidiary* in level and scope to the work itself. Examples of such legitimate assistance include: typing, coding, rating, proofreading, keypunching, search for specific bibliographical materials, computer programming, computer operation.

III. The regulation clearly *excludes*:

A. The writing of any portion of the text, whether of the paper itself, orof the summary, abstract, proposal, and the like.

B. Relegation to any other party of (1) any part of the design of the research, or (2) any *substantive* part of the execution of the research. Examples include: development of tests or questionnaires; general search and review of the literature; organization and collection of data; statistical analysis and interpretation.

IV. The relegation *may or may not exclude*:

A. Relegation of specific and circumscribed tasks in the execution of the project e.g., interviewing subjects; organization or preprocessing of data for the application of a particular statistical procedure).

B. Limited editorial help in the writing of the dissertation.

C. Consultation with an outside expert for the improvement of analysis and interpretation of the results.

V. In determining the legitimacy of assistance within this "gray" area, two governing principles should be observed:

A. In all instances, specific approval of the major professor or of the faculty advisor is to be secured in advance both as to the nature and source of such assistance. When passing on the legitimacy of such assistance, the major professor or advisor may consult with other faculty members or non-faculty individuals of his or her own choice, if the nature of assistance lies outside his or her own expertise.

B. If called upon, the student must demonstrate his or her complete and full command, in substance and in reasonable detail, or any aspect of the paper or dissertation. Request for such demonstration may be made by the faculty at any time and is not limited to formal examinations. This means that the student, in his or her work, ordinarily should not use

instruments, procedures, or methods beyond the scope or level at which he or she is formally trained in course work or which, to the satisfaction of cognizant faculty, he or she has acquired through self-study.

VI. It should be noted that within the "gray" area described in this section, specific instances of assistance on papers or dissertations may be legitimate *severally** (e.g., minor text editing **or** some help with data processing **or** relegation of some phase of data collection) but may not be legitimate in the *aggregate** (e.g., minor text editing **and** help in data processing and help in data collection).

VII. These guidelines are applicable whether assistance is secured gratis or for payment. For their own protection, however, whenever students engage technical or other legitimate assistance for payment, they should seek competent guidance as to the quality and reasonable cost of such services.

*Severally is being used in this sense to mean individually.

POLICY ON USE OF DEPARTMENTAL EQUIPMENT

Many pieces of expensive, scientific equipment are available in the department. Some are intended for general use by faculty and students, and others were acquired for the research projects of particular professors. These pieces of equipment are here to further our research efforts, and so will be made available to graduate students who needto use them. It is expected that use of departmental equipment, or, by permission, of equipment belonging to a particular professor's laboratory, will be done responsibly. Thismeans that equipment will be used properly, and that it will be left in clean and functionalcondition after use. Before using any piece of equipment for the first time, a student will seek permission from the individual in charge of it, obtain any necessary instructions andprotocols, and determine what needs to be done to keep that item functioning properly. Misuse or damage of departmental equipment, whether intentional or due to negligence,will be considered a clear indication that the individual concerned lacks the necessary attitudes and skills to use it. Cases of considerable neglect or irresponsibility may warrant loss of Teaching Assistantship and scholarship support.