The Molecular and Cellular Biology Program

Graduate Program Director
Wali Karzai, CMM Building, Room 244, (631) 632-1688

Graduate Program Coordinator
Amy Saas, Life Sciences Building, Room 338, Tel: (631) 632-8613

Degree Awarded
Ph.D. in Molecular and Cellular Biology

Web Site
http://www.stonybrook.edu/biochem/mcb/

Application
https://app.applyyourself.com/AYApplicantLogin/fl_ApplicantLogin.asp?id=sunysb-gs

Description of the Molecular and Cellular Biology Program

The Molecular and Cellular Biology (MCB) Graduate Program offers a multidisciplinary course of study leading to the Ph.D. degree. Diverse biological systems of study from plants to humans are pursued in MCB research laboratories. These systems are used to investigate a variety of biological topics including: Cancer, Infectious Disease, Gene Expression, Structural Biology, Neurobiology, DNA Replication, Development, Immune Response, Cell Cycle, Protein Trafficking, Signal Transduction, and Biological Membranes. The MCB Program provides students with the opportunity to select an academic program in one of three specializations:

1. Molecular Biology and Biochemistry
2. Cellular and Developmental Biology
3. Immunology and Pathology.

Each of the specializations enhances knowledge within the field to ensure our graduates are well equipped for a successful career in research.

The program of study in Molecular Biology and Biochemistry includes Physical Biochemistry and any of a number of electives. Training stresses biochemical and structural approaches to solve biological problems. The program of study in Cellular and Developmental Biology includes a course in Developmental Biology and any of a number of electives. Emphasis is placed on the control mechanisms that define and regulate growing and developing systems. The program of study in Immunology and Pathology includes courses in Immunology and General Pathology. This area of specialization emphasizes the cellular and molecular basis of human disease to foster a bridge between basic and clinical research.

The goal of this approach is to provide the student with the widest range of research possibilities. During the first year students participate in several core courses that serve to build a scholastic foundation for further study. The core courses include Graduate Biochemistry, Molecular Genetics, and Cell Biology. In addition, students receive training to critically evaluate original research articles in a Journal Club/Readings course. Students can select an area of specialization at the time of enrollment or they can decide on a course of study during their first year.

The MCB Program involves students in ongoing research projects as soon as they arrive on campus. During the first academic year, students train in four different research laboratories to help in choosing a mentor for thesis dissertation. The first laboratory training, or rotation, is usually at Stony Brook University, but subsequent rotations can be performed at Cold Spring Harbor Laboratory or Brookhaven National Laboratory. The MCB Program crosses departmental boundaries and institutions to offer the student thesis research training in nearly 100 different laboratories. A decision for a thesis advisor is generally made by the end of the first academic year and research studies will subsequently form the foundation of a Ph.D. thesis.

All students in the MCB Program gain experience and skills in teaching and oral presentation of their research studies. Students assist in teaching undergraduate laboratory or lecture courses during two consecutive semesters, usually the second and third semesters. The teaching experience can include assistance in formulation/grading of examinations and individual tutoring sessions. In the third and subsequent years graduate students present their research progress to other students and faculty in a seminar forum. The student seminars are an opportunity to gain communication skills and to learn about ongoing research of other students in different laboratories. In addition to student seminars, a number of faculty from outside the institution are invited for weekly seminars. These are opportunities to meet visiting scientists who are leaders in their field and to learn of their latest findings.

In the second year of the MCB Program students take a comprehensive qualifying exam. Following successful performance, students focus on their thesis research. By the end of the second year, students prepare a written Ph.D. Thesis Proposal in consultation with their faculty thesis advisor. The proposal is defended orally before a proposal committee comprised of faculty selected by the student. Following successful defense of the proposal, the student advances to candidacy and the proposal committee along with the faculty advisor become the student’s Ph.D. Thesis Committee. The Ph.D. Thesis Committee meets at least once a year with the student to assess progress and discuss research strategies.

For more information, visit www.sunysb.edu/biochem/mcb.

Admission requirements for the Molecular & Cellular Biology Graduate Program

In addition to the minimum requirements of the Graduate School, the following are suggested requirements:
A. A bachelor’s degree with the following minimal preparation: mathematics through one year of calculus, chemistry (including organic chemistry and laboratory), general physics, and one year of biology (including laboratory);

B. A minimum grade point average of 3.0 (B) in undergraduate courses including science and mathematics courses;

C. Letters from three previous instructors;

D. A report of Graduate Record Examination (GRE) General Test scores;

E. Acceptance by both the Graduate Program in Molecular and Cellular Biology and the Graduate School. In special cases, students not meeting requirements A and B may be admitted on a provisional basis. These students must act to remedy deficiencies within the first year according to the program’s requirements.

Facilities of the Molecular and Cellular Biology Program

The Biological Sciences Division and Health Sciences Center are well equipped for work in developmental and cellular biology. Individual faculty laboratories and central services provide a full array of state-of-the-art equipment. These include the Flow Cytometry Facility, the Cell Culture and Hybridoma Facility, the Transgenic Mouse Facility, the University Microscopy Imaging Center, and the Center for Analysis and Synthesis of Macromolecules. (proteomic and metabolomics). The Health Sciences Library contains a comprehensive collection of biomedical journals and books and is complemented by the Melville Library on the main campus.

Requirements for the PhD in Molecular and Cellular Biology

A. Course Requirements

Biochemistry and Molecular Biology Specialization:

1. Molecular Genetics (MCB 503)

2. Graduate Biochemistry (MCB 520)

3. Biomembranes (MCB 517)

4. Cell Biology (MCB 656)

5. Structural Biology and Spectroscopy (MCB 512)

6. One approved elective graduate course

7. Students in their first academic year also rotate in four laboratories with the goal of selecting an environment for their thesis research.

8. Participation in Journal Club (MCB 531, MCB 532); Student Seminars (MCB 603, MCB 604); Visiting Scientists Seminars (MCB 601, MCB 602)

9. Enrollment in the first year in Ethics (GRD 500)

10. Enrollment in the first semester in Computational Methods in Biochemistry and Structural Biology (BSB 515)

Cell and Developmental Biology Specialization:

1. Molecular Genetics (MCB 503)

2. Graduate Biochemistry (MCB 520)

3. Biomembranes (MCB 517)

4. Cell Biology (MCB 656)

5. Developmental Biology (MCB 657)

6. One approved elective graduate course

7. Students in their first academic year also rotate in four laboratories with the goal of selecting an environment for their thesis research.

8. Participation in journal club (MCB 531/532); Student Seminars (MCB 603, MCB 604); Visiting Scientists Seminars (MCB 601, MCB 602)

9. Enrollment in the first year in Ethics (GRD 500)

10. Enrollment in the first semester in Computational Methods in Biochemistry and Structural Biology (BSB 515)

Immunology and Pathology Specialization:

1. Molecular Genetics (MCB 503)

2. Graduate Biochemistry (MCB 520)

3 Biomembranes (MCB 517)
4. Cell Biology (MCB 656)
5. General Pathology (HBP 531)
6. Immunology (HBP 533)

7. Students in their first academic year also rotate in four laboratories with the goal of selecting an environment for their thesis research.

8. Participation in journal club (HBP 590); Student Seminars (MCB 603, MCB 604); Visiting Scientists Seminars (MCB 601, MCB 602)

9. Enrollment in the first year in Ethics (GRD 500)

10. Enrollment in the first semester in Computational Methods in Biochemistry and Structural Biology (BSB 515)

Students must achieve a B or better in all required courses and must maintain a B average in elective courses.

B. Qualifying Examination
At the beginning of the fourth semester, the student must pass a written qualifying examination.

C. Research Proposal
Following successful completion of the qualifying examination, the student writes a research proposal based on the probable area of the student’s Ph.D. dissertation. The proposal is defended orally to a faculty examination committee that does not include the student’s research advisor. The proposal examination normally takes place by the end of the second year. After passing the proposal examination, the faculty committee and Ph.D. research advisor usually become the student’s Ph.D. thesis committee and meet with the student at least once a year to follow his or her thesis progress.

D. Teaching Experience
All students are required to gain experience in teaching by assisting in laboratory sections, leading discussion sections, or helping to formulate and grade examination papers. The teaching experience may be in either undergraduate or graduate courses, and extends over a period of two semesters.

E. Advancement to Candidacy
When the above requirements have been satisfactorily completed, a recommendation for advancement to candidacy for the Ph.D. will be forwarded to the Graduate School.

F. Ph.D. Dissertation
During the second year, the student initiates a dissertation research project in the laboratory of a particular member of the program faculty. After the student has passed the proposition examination, a research committee is appointed to guide the dissertation research, and when the research nears completion, a dissertation examining committee is appointed by the dean of the Graduate School.

G. Dissertation Defense
The dissertation defense, which completes the requirements for the Ph.D., consists of a public seminar presentation of the dissertation work followed by an oral examination before the dissertation examining committee. Successful completion of the Ph.D. degree requires that a candidate publish a first-authored paper in a refereed journal. The paper must be published, accepted, or in press by the time of the thesis defense.

H. Residence Requirement
The University requires at least two consecutive semesters of full-time graduate study. The demands of the course of study necessitate a longer period of residence.

I. MCB Policies for Masters Degrees
The MCB program does not enroll new students in a Masters program; however, the program does provide its active Ph.D. students the option for a terminal Masters degree.

In addition, the student must:

1. 30 credits of Graduate Course work from the approved PhD curriculum in Molecular and Cellular Biology, with a minimum GPA of 3.0.
2. Take the qualifying exam and achieve a grade considered satisfactory for a M.A.
3. Prepare a written Thesis. The thesis need not contain a significant amount of experimental data. It will be sufficient for such a thesis to review the background of a research project initiated by the student, plus a description of the experimental strategy that was to be undertaken, and any results obtained.

For a student who has achieved a satisfactory grade in the qualifier exam, maintained progress towards the Ph.D., and has conditionally passed the Proposition Exam, a written Thesis will not be required. The written portion of the Proposition Exam will be considered an acceptable substitute for the thesis.

Please note that students who opt for either an M. A. or M. Phil. degree are no longer eligible to pursue a Ph.D. degree in the MCB program.
Faculty of the Molecular and Cellular Biology Graduate Program

**Distinguished Professors**

Benach, Jorge L. 2, Ph.D., 1972, Rutgers University: Host response to bacterial infections.

Citovsky, Vitaly, Ph.D., 1987, Hebrew University, Israel: Nuclear targeting and intercellular communication in plants.


Lennarz, William, J.1, Ph.D., 1959, University of Illinois: Biosynthesis and function of glycoproteins in cell-cell interactions.

London, Erwin1, Ph.D., 1979, Cornell University: Membrane protein structure/translocation/folding Structure and function of sphingolipid/cholesterol rafts in membranes.

Sternplancz, Rolf1, Ph.D., 1967, Harvard University: Chromatin structure and function in yeast; histone modifying enzymes.

Wimmer, Eckard2, Ph.D., 1962, University of Gottingen, Germany: RNA virus genetics, replication, and pathogenicity; cellular virus receptors; whole viral genome synthesis; development of novel vaccines.

**Professors**

Bingham, Paul M.1, Ph.D., 1979, Harvard University: Genetic control of development and gene expression in animals.

Bogenhagen, Daniel F.4, M.D., 1977, Stanford University: Mitochondrial DNA; Mitochondrial proteomics.

Brown, Deborah1, Ph.D., 1987, Stanford University: Cholesterol/sphingolipid-rich membrane domains; role in endocytosis.

Bynum, David R.1, Ph.D., 1981 Dartmouth College: Director, Long Island Group Advancing Science Education, Stony Brook University.

Chen, Wen-Tien8, Ph.D., 1979, Yale University: Proteases and integrins in cancer invasion, metastasis, and angiogenesis.

Dean, Neta1, Ph.D., 1988, University of California, Los Angeles: Protein glycosylation, fungal cell wall biosynthesis; fungal pathogenesis.

Demple, Bruce4, Ph.D., Defining new repair pathways for oxidative DNA damage in the nucleus and the mitochondria of mammalian cells.

Deutsch, Dale1, Ph.D., 1972, Purdue University: Metabolism and uptake of the endocannabinoids (anandamide and 2-AG).


Furie, Martha5, Ph.D., 1980, Rockefeller University: Interactions among pathogenic bacteria, endothelium, and leukocytes.

Futcher, Bruce2, Ph.D., 1981 Oxford University: Cell cycle control, microarrays, genomics.

Gergen, J. Peter1, Ph.D., 1982, Brandeis University: Pattern information and the regulation of gene expression during Drosophiladevelopment.

Ghebrehiwet, Berhane8, D.V.M./D.Sc., 1974, University of Paris, France: Biochemistry; Role of complement C1q receptors during infection and inflammation.

Halegoua, Simon3, Ph.D., 1978, Stony Brook University: Control of the neuronal phenotype and survival by growth factors using biochemical, molecular and cell biological approaches.

Haltiwanger, Robert1, Ph.D., 1986, Duke University: Glycobiology; role of glycosylation in signal transduction and development. Hannun, Yusuf. 1.7, MD , 1, Bioactive lipids in cancer pathogenesis and therapeutics.

Hayman, Michael2, Ph.D., 1973, Institute for Medical Research, England: Viral/cellular oncogenes; differentiation of erythroid cells.

Hearing, Patrick2, Ph.D., 1980, Northwestern University: Adenovirus-host cell interactions, adenovirus assembly and vectors for gene therapy.


Konopka, James2, Ph.D., 1985 University of California, Los Angeles: Signal transduction, morphogenesis, and genetics of pathogenic fungi.

Levine, Joel M.3, Ph.D., 1980, Washington University: Cell-surface molecules of the developing nervous system.

Lin, Richard6, M.D., 1988, University of California, San Francisco: Physiology of phosphoinositide 3-kinase signaling

Ma, Yupo12 M.D., Jinan University, Ph.D., University of South Alabama: Leukemic stem cells, stem cell therapy and tissue repair.

Malbon, Craig C.4, Ph.D., 1976, Case Western Reserve University: Signal transduction and gene regulation in differentiation and development: Roles of G-proteins.

Marcu, Kenneth B.1, Ph.D., 1975, Stony Brook University: NF-kappaB kinase signaling in stress, immunity and cancer; mechanisms of action of AID in adaptive immune responses.

McLaughlin, Stuart6, Ph.D., 1968, University of British Columbia, Canada: Calcium/phospholipid second messenger system. Miller, Todd W.6, Ph.D., 1989, Rockefeller University: The regulation and substrate specificity of tyrosine kinases.


Neimam, Aaron1, Ph.D., 1994, University of California, San Francisco: Vesicle trafficking and intracellular signaling in yeast.

Obeid, Lina, 7, Ph.D Bioactive lipids in Inflammation, Aging and Cancer.


Reich, Nancy L.2, Ph.D., 1983, Stony Brook University: Signal transduction and gene expression in response to cytokines and virus.

Scarlata, Suzanne6, Ph.D., 1984, University of Illinois: Structure/function studies of G proteins and effectors.

Steigbigel, Roy T.8, M.D., 1966, University of Rochester: Immune dysfunction induced by HIV infection.

Simmerling, Carlos9, Ph.D. 1994, University of Illinois at Chicago: Development of tools for efficient and simulation of chemical systems and using them to study the structure and dynamics of molecules involved in biological processes.

Thanassi, David G.2, Ph.D., 1995 University of California at Berkeley: Virulence factors of pathogenic bacteria.

Thomsen-Carino5, Patricia, Ph.D., The evolution of molecular and cellular changes during the development of colorectal and breast cancer

White, Thomas6, Ph.D., 1994, Harvard University: Molecular biology and physiology of gap junction channels.

Wollmuth, Lonnie3, Ph.D., 1992 University of Washington: Molecular mechanisms regulating excitatory synaptic transmission in the brain.

Yang, Vincent W., Ph.D., Princeton University; 1984, M.D., Rutgers Robert Wood Johnson Medical School: Mammalian stem cell biology and oncogenesis.

Associate Professors

Boon, Elizabeth M.9, Ph.D., 2003, California Institute of Technology: Nitric oxide signaling in bacteria.

Bowen, Mark6, Ph.D., 1998, University of Illinois, Chicago: Molecular recognition at the synapse.

Cao, Jian8, M.D., 1986, Zhengzhou University School of Medicine; M.S., 1992, Peking Union Medical College/Chinese Academy of Medical Sciences: Cancer invasion/metastasis and anti-cancer drug discovery.

Carpino, Nicholas6, Ph.D., 1997, Stony Brook University: Positive and negative regulation of T cell receptor signaling.

Carrico, Isaac9, Ph.D., 2003, California Institute of Technology: Site-specific protein labeling; glycoproteins.
Chen, Emily, Ph.D., 2002, University of California, San Diego: identifying determinants of breast cancer metastasis and mass spectrometry-based proteomics.

Colognato, Holly, Ph.D., 2000, Rutgers University: Extracellular matrix in the brain; roles during development and during neurodegeneration.

Czaplinski, Kevin, Ph.D., 1999, UMDNJ-Robert Wood Johnson Medical School: Post-transcriptional control of gene expression in the nervous system.

Fleit, Howard B.5, Ph.D., 1980, New York University: Leukocyte Fc receptors; macrophage differentiation.


Ghazizadeh, Soosan, Ph.D., 1994, Stony Brook University: Epithelial stem cell biology; skin bioengineering and gene therapy.

Holdener, Bernadette, Ph.D., 1990, University of Illinois: The role of protein folding and O-fucosylation during embryonic development and stem cell differentiation.


Kernan, Maurice, Ph.D., 1990, University of Wisconsin: Genetics of touch and hearing in Drosophila; ciliogenesis and ciliary signaling.

Kew, Richard R., Ph.D., 1986, Stony Brook University: Role of complement activation and leukocyte chemotaxis in inflammation.

Krug, Laurie, Ph.D., 2001, Emory University: Virus-host interactions during chronic gammaherpesvirus infection.


McKinnon, David, Ph.D., 1987, John Curtin School of Medical Research, Australia: Molecular physiology of sympathetic neurons and cardiac muscle.

Moriya, Masaaki, Ph.D., 1981, Nagoya University, Japan: Cellular responses to DNA damage.

Martinez, Luis A., PhD, understanding how alterations in the p53 gene contribute to the development of cancer.

Prives, Joav, Ph.D., 1968, McGill University, Canada: Cytoskeletal membrane interactions in muscle cells.

Quitschke, Wolfgang, Ph.D., 1983, Stony Brook University: Gene regulation of proteins associated with neurodegenerative diseases.


Simmerling, Carlos, Ph.D., 1994, University of Illinois at Chicago: Development of tools for efficient and simulation of chemical systems and using them to study the structure and dynamics of molecules involved in biological processes.

Sirotkin, Howard, Ph.D., 1996, Albert Einstein College of Medicine: Vertebrate neural development and patterning.


Spitzer, Eric D., M.D./Ph.D., 1985, Johns Hopkins University: Molecular biology of Cryptococcus neoformans.


Thomson, Gerald H., Ph.D., 1988, Rockefeller University: Empoyic development mechanisms and their evolution.

Tsirka, Styliani-Anna, Ph.D., 1989, University of Thessaloniki, Greece: Neuronal-microglial interactions in the physiology and pathology of the central nervous system.

van der Velden, Adrianus, Ph.D., 2000, Oregon Health and Science University: The mammalian T cell response to Salmonella enterica serovar Typhimurium.


Zieve, Gary, Ph.D., 1977, Massachusetts Institute of Technology: Assembly/transport of snRNP particles.

Zong, Wei-Xing, Ph.D., 1999, University of Medicine & Dentistry of New Jersey: Molecular regulation of apoptotic and necrotic cell death.
**Assistant Professors**

Aguirre, Adan Adan4, Ph.D., 2002, Centro de Investigacion y de Estudios Avanzados IPN, Mexico: Endogenous NG2 progenitor cells as cell-based replacement for a variety of brain pathologies

Michael Airola, Ph.D., Structural biology of lipid modifying enzymes

Nurit, Ballas 1, Ph.D., 1989, Hebrew University, Israel: The cellular and molecular mechanisms underlying the initiation and rescue of Rett syndrome.

Chan, Chia-Hsin Chia-Hsin4, Ph.D. 2007, National Taiwan University: Molecular mechanisms of cancer development; cancer metabolism and stemness.

Chen, Jiang8, M.D., Ph.D., 1995, Henan Medical University, China; 2001, University of Heidelberg, Germany: Planar cell polarity and primary cilia in skin and hair follicle development and skin cancers.

French, Jarrod, Ph.D., Structural Biology, Chemical Biology and Enzymology of Metabolic Pathways and Protein complexes

Gao, Liang, Ph.D., 2009, Purdue University: Optical imaging, fluorescence microscopy, analytical instrumentation. Glynn, Steven 1 Ph.D.

Kaczocha, Martin, Ph.D., 2009, Stony Brook University: Endocannabinoids, lipid metabolism, inflammation, and pain.

Kim, Hyungjin4, Ph.D., Genome instability, Ubiquitin/SUMO Signaling, Cancer pathogenesis - Regulation of DNA repair in cancer susceptibility pathways.

Kumar, Pawan, Ph.D., Immunology, gut microbiota-immune cells interaction. Intestinal and autoimmune inflammation.

Levy, Sasha F, 41, Ph.D., 2005, University of California, Santa Barbara: Physical and quantitative biology.


Martin, Benjamin L, 21, Ph.D., 2005, University of California, Berkeley: Stem cell maintenance and differentiation; developmental mechanisms of cancer pathogenesis.

Matus, David Q, 21, Ph.D., 2006, University of Hawaii: Evolutionary, cellular, and developmental approaches to studying nematode uterine-vulval morphogenesis.


Sheridan, Brian, 2, Ph.D., Mucosal Immunology, T cell memory, Vaccine design, Host-pathogen interactions

Sneider, Ashly, Ph.D., Bioactive lipids and dietary fatty acids in inflammation and cancer.

Tan, Dongyan, 3, Ph.D., Structure and function of macromolecules involved in epigenetic regulation; biophysical behavior of model lipid membranes. Primary appointment: Department of Pharmacological Sciences gene expression.

**Adjunct Faculty**


Joshua-Tor, Leemo, 15 Ph.D., 1991, The Weizmann Institute of Science: Structural biology; X-ray crystallography; molecular recognition; nucleic acid regulation; RNAi.

Krainer, Adrian, 15 Ph.D., 1986, Harvard University: mRNA splicing; gene expression; RNA-protein interaction. Lazebnik, Yuri, Professor, 15 Ph.D., 1986, St. Petersburg State University, Russia: Molecular mechanisms of apoptosis.

Lowe, Scott, Professor, 15 Ph.D. Massachusetts Institute of Technology: Modulation of apoptosis; chemosensitivity; senescence by cancer genes. Martienssen, Robert, Professor, 15 Ph.D., Cambridge University: Plant genetics; transposons; development; gene regulation; DNA methylation.

Mills, Alea, A., Associate Professor, 15 Ph.D., 1997 University of California: Cancer; development; aging; senescence; epigenetics.

Muthuswamy, Senthil, K., Assistant Professor, 15 Ph.D., 1995 McMaster University: Understanding cancer initiation using three-dimensional epithelial structures.

Setlow, Richard, Professor, 1, 13 Ph.D., 1947, Yale University: DNA damage and repair; carcinogenesis and mutagenesis in fish, light-induced malignant melanoma.

Spector, David L., Director of Research & Professor, 15 Ph.D., 1980, Rutgers University: Spatial organization of gene expression.
Stenlund, Arne, Associate Professor. Ph.D., 1984, Uppsala University, Sweden: DNA replication of papillomaviruses.

Stillman, Bruce, President & Professor. Ph.D., 1979, Australian National University: DNA replication and chromatin assembly in human and yeast cells.


Tonks, Nicholas, Professor. Ph.D., 1985, University of Dundee, Scotland: Characterization of protein tyrosine phosphatases.

Trotman, Lloyd C., Associate Professor. Ph.D., 2001, University of Zurich: Cancer modeling and treatment; senescence and tumor progression; cancer visualization; PTEN regulation.

Vakoc, Christopher, Assistant Professor. M.D., Ph.D., 2007, University of Pennsylvania: chromatin regulators and oncogenic signal transduction cascades.


Number of teaching, graduate, and research assistantships, fall 2011-12: 95

1) Department of Biochemistry and Cell Biology
2) Department of Molecular Genetics and Microbiology
3) Department of Neurobiology and Behavior
4) Department of Pharmacological Sciences
5) Department of Pathology
6) Department of Physiology and Biophysics
7) Department of Psychiatry
8) Department of Medicine
9) Department of Chemistry
10) Department of Oral Biology and Pathology
11) Department of Obstetrics and Gynecology
12) Department of Anatomical Sciences
13) Brookhaven National Laboratory
14) Recipient of the State University Chancellor’s Award for Excellence in Teaching, 1975
15) Cold Spring Harbor Laboratory
16) Department of Applied Math and Statistics
17) Department of Neurosurgery

NOTE: The course descriptions for this program can be found in the corresponding program PDF or at COURSE SEARCH.