Committee on Cancer Biology

Chair
- Kay Macleod, Ben May Department for Cancer Research

Professors
- Erin Adams, Biochemistry and Molecular Biology
- Habibul Ahsan, Health Studies
- Eric Beyer, Pediatrics
- Douglas Bishop, Radiation and Cellular Oncology
- Susan Cohn, Pediatrics
- Suzanne Conzen, Medicine
- M. Eileen Dolan, Medicine
- Wei Du, Ben May Department for Cancer Research
- Richard Fehon, Molecular Genetics and Cell Biology
- Edwin Ferguson, Molecular Genetics and Cell Biology
- Yang-Xin Fu, Pathology
- Thomas Gajewski, Medicine
- David Grdina, Radiation and Cellular Oncology
- Geoffrey Greene, Ben May Department for Cancer Research
- Gregory Karczmar, Radiation and Cellular Oncology
- Stephen Kron, Molecular Genetics and Cell Biology
- Howard Halpern, Radiation and Cellular Oncology
- Lucy Godley, Medicine
- Michelle Le Beau, Medicine
- Ernst Lengyel, Obstetrics and Gynecology
- Maciej Lesniak, Surgery
- Anning Lin, Ben May Department for Cancer Research
- Mark Lingen, Pathology
- Olufunmilayo Olopade, Medicine
- Ilaria Rebay, Ben May Department for Cancer Research
- Carrie Rinker-Schaeffer, Surgery
- Marsha Rosner, Ben May Department for Cancer Research
- Benoit Roux, Biochemistry and Molecular Biology
- Ravi Salgia, Medicine
- Hans Schreiber, Pathology
- Walter Stadler, Medicine
- Wei-Jen Tang, Ben May Department for Cancer Research
The Committee on Cancer Biology (CCB) provides multidisciplinary and integrated training in cancer biology with an emphasis on innovation and critical thinking in cancer research. The program provides doctoral students with the most up-to-date knowledge and research training with the goal of preparing students for leadership and research careers in academia, industry, clinical research, science journalism, advocacy and policy and other relevant areas of the biomedical workforce. The program prepares students to conduct research by offering a core curriculum that focuses on multiple aspects of cancer biology, including molecular mechanisms of cancer, tumor progression and metastasis, autophagy and tumor metabolism, cancer genomics, computational approaches and big data analysis, mechanisms of drug resistance and tumor heterogeneity, in addition to translational research approaches. With approximately 65 faculty members from across the
Biological Sciences Division with diverse interests in all of these research areas, students have a broad choice of research concentrations to select from for their thesis research project.

The CCB is committed to fostering interactions amongst graduate students, postdoctoral fellows, and faculty, and has a consistent track record of success in mentorship with many trainees publishing their work in outstanding journals and going on to run their own research labs. This is achieved through our core curriculum, a weekly cancer biology seminar series, journal clubs, student research presentations, group research meetings, an annual retreat and symposia. All of our students attend the AACR meeting in their third year of graduate school and numerous other opportunities are available to our students to present their data at international meetings and symposia. Our dedicated program in cancer biology is one of the most established in the country and is supported by an NCI training grant in addition to valuable support from foundations allowing us to continue to recruit and train the next generation of expert cancer biologists.

In addition to formal course work, the program sponsors a student led journal club, a student/postdoctorate research presentation group, and an annual cluster retreat in which students and trainees present their research findings. In addition, the program co-sponsors the Ben May Symposium with the Ben May Department for Cancer Research. This symposium brings speakers of international renown to campus. Students and trainees also have the opportunity to attend national meetings and cancer biology workshops off campus. Through the auspices of the Ben May Department for Cancer Research, the Section of Hematology/Oncology, and the University of Chicago Cancer Research Center (an NCI designated Cancer Center), there are several additional seminar series and a clinical cancer research/basic science research translational conference. Thus, there is a thriving, interactive community of cancer researchers.

**ADMISSION**

Prospective students interested in obtaining the Ph.D. in cancer biology should submit an application to the Biological Sciences Division by December 1st of each year; indicate their cluster of interest as Biomedical Sciences and select Cancer Biology as their proposed degree program.

**THE DEGREE OF DOCTOR OF PHILOSOPHY**

Ph.D. requirements include:

- Completion of 9.5 course credits consisting of basic science, cancer biology and elective courses
- A preliminary examination
- A dissertation based on original research
- A final thesis examination
CANCER BIOLOGY COURSES

CABI 30500. Heterogeneity in Human Cancer: Etiology and Treatment. 100 Units.
This course addresses the importance of understanding human tumor heterogeneity (organ site by organ site) in terms of predicting whether tumors will progress to malignancy and how tumors will respond to standard treatments or require tailored molecular therapeutics. Alternating lecture and discussion lectures will explore and tease apart the controversies in the field that limit progress in cancer prevention, diagnosis and treatment. At the end of the course, students should have an in-depth understanding of the complexities, challenges and opportunities facing modern cancer researchers and clinical oncologists and be able to discuss novel scientific approaches to solving these issues.
Instructor(s): K. MacLeod Terms Offered: Spring
Prerequisite(s): A grade of B or better in BIOS 25108
Equivalent Course(s): BIOS 25308

CABI 30800. Cancer Biology 1: Fundamentals in Cancer Biology. 100 Units.
This course introduces students to key aspects of cancer biology, including fundamental molecular mechanisms (includes tumor suppressor and oncogene function, cell cycle checkpoint control, cytokinesis defects and aneuploidy, DNA damage sensing repair, cell death mechanisms, cellular senescence) underpinning the initiation and progression of disease. These lectures are taught alongside an introduction to clinical and translational perspectives, on the topics of epidemiology, pathology, diagnosis and staging, and the basis for various therapeutic strategies with an emphasis on four different organ sites to illustrate key points. The course concludes with an examination of how to identify important research questions in cancer biology and the importance of innovation in research.
Instructor(s): M. Lingen Terms Offered: Autumn

CABI 30900. Cancer Biology 2: Molecular Mechanisms in Cancer Biology. 100 Units.
This course provides students with an in-depth understanding of how key cellular processes are deregulated in cancer and the molecular mechanisms underpinning these defects. The course covers cell cycle checkpoint control, cell death, tumor suppressor and oncogene function, DNA repair mechanisms, epigenetics of cancer, nuclear hormone receptor activity in cancer, tumor metabolism, hypoxia responses, angiogenesis and metastasis. In addition to material covered in formal lectures, discussion sessions cover tumor stem cells, "oncogene addiction," inflammatory responses, cancer therapeutics, mouse models of human cancer and other topical subjects relevant to understanding tumor initiation and progression, as well as how current research may facilitate cancer treatment.
Instructor(s): Donald Vander Griend Terms Offered: Winter
Equivalent Course(s): CCTS 40200, MPMM 30900
CABI 31300. Cancer Biology 3: Translational Approaches in Cancer Research. 100 Units.
This is a lab/clinic-based course in which students complete training objectives in multiple modules of translational/applied cancer research (clinical, animal models, targeted therapy, intellectual property, bioinformatics, nanotechnology and population science). The emphasis of the course is hands-on experience and a high degree of independence is expected. Trainees select a topic on which to write up a final discussion paper and each student will deliver a presentation on their topic that incorporates elements of the different translational elements discussed during the quarter.
Instructor(s): K. Macleod Terms Offered: Spring

CABI 31500. Cancer Biology 4: Hypothesis Design and Grant Writing. 100 Units.
This is a course based on developing and testing hypotheses that will provide an overview and real-world experience of the grant-writing process (F31 format), as well as responding to criticisms and presenting one’s grant in a precise but concise manner. As it is a course centered around in-class discussion, it is dependent on the consistent creativity and participation of students in order to provide and receive useful feedback to and from their colleagues. The grant will formulate hypotheses around the student’s own research project and the completed grant should provide a strong basis for future F31 or other fellowship applications.
Instructor(s): L. Becker and X. Wu Terms Offered: Autumn. This course will not be offered until Autumn 2016. It is being implemented as part of the core curriculum for students matriculating in 2015-2016, but they will not take it until Autumn of their second year. Current first years completed the course Spring 2015.

CABI 39000. Cancer Biology 5: Introduction to Experimental Cancer Biology. 050 Units.
This is a primary literature-based course that tracks our outstanding CCB Seminar Series and also incorporates seminars of interest from other Divisional programs. Typically, students meet to discuss research papers published by the following week’s seminar speaker, attend the seminar, and then meet with the speaker afterward. Faculty hosts of outside speakers are also encouraged to attend the relevant class. The goal of the course is to broaden the student’s exposure to current cutting edge research and to encourage discussion of scientific ideas among peers, as well introduce students to some of the major figures in cancer research with whom they may pursue future post-doctoral opportunities. All students start with an “A” grade but lose grade points if class performance or attendance is inadequate. Students are required to take this course for six quarters during years 1-2.
Instructor(s): K. Onel, J. LaBelle Terms Offered: Autumn,Spring,Winter
CABI 40400. Genomics of Personalized Medicine. 050 Units.
Aspects of genomics have slowly become integrated into many levels of medical research. This has led to the incorporation of genomics into clinical trial design, cost-effectiveness research, pharmacogenetic studies, as well as influencing the direction of basic science investigation. The field of medical genomics is fast moving and requires specialized knowledge in genetics, statistics, molecular and cell biology, animal models, and epidemiology, thus making it a highly collaborative and translational field. This is a new course designed specifically for upper level graduate students, fellows and junior faculty members, and is meant to provide a strong overview of several areas of knowledge needed to integrate genomics into medical research. Each class will address a different aspect of genetics and genomics as they relate to disease, with emphasis on state-of-the-art research methods, current study designs and analysis, and relevant clinical examples drawn from a wide range of medical fields. At the end of this course, clinicians and translational researchers will have a good understanding of how genetics/genomics provides a basis for personalized medicine.
Instructor(s): Minoli Perera Terms Offered: Summer
Equivalent Course(s): MPMM 40400,CCTS 40003

CABI 47510. Pharmacogenomics: Discovery and Implementation. 100 Units.
Pharmacogenomics is aimed at advancing our knowledge of the genetic basis for variable drug response. Advances in genetic knowledge gained through sequencing have been applied to drug response, and identifying heritable genetic variants that predict response and toxicity is an area of great interest to researchers. The ultimate goal is to identify clinically significant variations to predict the right choice and dose of medications for individuals—"personalizing medicine." The study of pharmacogenomics is complicated by the fact that response and toxicity are multigenic traits and are often confounded by nongenetic factors (e.g., age, co-morbidities, drug-drug interactions, environment, diet). Using knowledge of an individual's DNA sequence as an integral determinant of drug therapy has not yet become standard clinical practice; however, several genetics-guided recommendations for physicians have been developed and are highlighted. The ethics and economics of pharmacogenomics are also discussed.
Instructor(s): M. E. Dolan, R. S. Huang Terms Offered: Spring
Prerequisite(s): BIOS 20186 and 20187 and consent of Instructor.
Equivalent Course(s): CCTS 40006,BIOS 25310