

# WINSTON CHURCHILL FOUNDATION OF THE UNITED STATES

## WHAT AND WHERE SHOULD YOU STUDY AT CAMBRIDGE?

This document is intended to provide an introduction and overview of the programs in the biological and chemical sciences, engineering, and mathematics at the University of Cambridge. It does not pretend to be complete, since departments regularly introduce new programs or modify existing offerings. The Churchill Foundation hopes that you will find it a useful guide to advanced study at Cambridge.

The landscape of the disciplines at the University of Cambridge — the manner in which fields are organized — varies considerably from the arrangements current in our American colleges and universities. Not only are there more departments and programs in the biological and physical sciences, engineering, and mathematics at Cambridge than at a typical large American research institution, but these departments and programs do not necessarily coincide neatly with departments and programs in the United States that have the same names. The search for the laboratory by an applicant for the Churchill Scholarship is all the more complicated by current developments in the sciences where shifting boundaries, interdisciplinary areas, and nascent fields render the names of departments not entirely lucid or heuristic. Consequently, an applicant has the additional responsibility of finding the program that best fits his or her intellectual needs and aspirations. Many applicants for the Churchill scholarship have reported that the very task of finding the appropriate program and writing the application is something worthwhile in itself, because it permits them to focus on what they most wish to accomplish.

There are essentially two different degrees at the University of Cambridge available to applicants for the Churchill Scholarship: the Master of Philosophy (commonly called the MPhil) and the Master of Advanced Study (commonly called the MAST). Neither degree is comparable to the Master of Arts or the Master of Science in the United States. The MPhil is more advanced than an American master's degree, and the MAST is unlike any American degree. (In the past the MAST was called the Certificate of Advanced Study, and there were also degrees called the Diploma and the Certificate of Post-Graduate Study.)

The “standard” MPhil is a research degree, a program that entails full-time research in a laboratory and that culminates in a thesis and a *viva* examination (an oral examination conducted by one examiner from Cambridge and one external examiner, both suggested by the director of the laboratory and approved by the department). There are no courses available in a standard research degree, although some MPhil students avail themselves, with the approval of their project directors, of the opportunity to sit in on advanced (fourth-year) undergraduate courses. This “standard” MPhil is the common program in the biological and physical sciences (Biology, Biochemistry, Clinical Biochemistry, Chemistry, (experimental) Physics, etc.). Some MPhil programs (e.g. Computational Biology, Engineering, Translational Medicine and Therapeutics, among others) involve required and optional courses, a thesis, and, sometimes, a *viva*. The MAST in Applied Mathematics and Theoretical Physics and in Pure Mathematics --- also known as Part III of the Mathematical Tripos --- involves almost exclusively courses (and hence is called a taught program) and written examinations but provides the opportunity to substitute a research paper for one examination. Re-

cently, some Churchill Scholars in Applied Mathematics have pursued research programs that they have arranged in advanced in addition to their taught courses.

In exploring the departments and programs at Cambridge, it is important that applicants for the Churchill Scholarship find not only the right intellectual fit but also the right personal fit. One should consider the size of a laboratory and the kind of work that the laboratory is currently pursuing; this information is readily available on the Web site of the laboratory. The instructions for the Churchill Scholarship application strongly recommend that applicants email the directors of laboratories to discuss the possibility of joining that laboratory in the spring of junior. Some laboratories are now conducting Skype interviews with candidates or asking for letters of recommendation. Such email exchanges and Skype conversations can often provide a good deal of additional information about the social workings of that laboratory.

There are more departments at the University of Cambridge than there are in even our largest American research universities, and it is not uncommon for there to be overlap in fields across departments. The academic disciplines at Cambridge are organized into Faculties, many of which contain one or more Departments, which in turn contain different programs. There are, in addition, academic centers and institutes. It is *imperative* to note that not all programs have a Master of Philosophy and that all of the programs within the sciences and engineering are not necessarily eligible for the Churchill Scholarship: degree programs that are largely concerned with policy and the social sciences are not appropriate for the Churchill Scholarship. The following list is intended to serve as a guide. It is intentionally not complete, since it does not include museums and programs that do not offer degree programs. (Please note that British spelling is used here in accordance with the Cambridge Web site.)

## SCHOOL OF BIOLOGICAL SCIENCES (<http://www.bio.cam.ac.uk/>)

### FACULTY OF BIOLOGY (<http://www.bio.cam.ac.uk/sbs/facbiol/>)

- Biochemistry (<http://www.bioc.cam.ac.uk/>)
- Centre for Family Research (<http://www.cfr.cam.ac.uk/>)
- Genetics (<http://www.gen.cam.ac.uk/>)
- Pathology (<http://www.path.cam.ac.uk/>)
- Pharmacology (<http://www.phar.cam.ac.uk/>)
- Physiology, Development and Neuroscience (<http://www.pdn.cam.ac.uk/>)
- Plant Sciences (<http://www.plantsci.cam.ac.uk/>)
- Botanic Garden (<http://www.botanic.cam.ac.uk/>)
- Psychology (<http://www.psychol.cam.ac.uk/>)
- Zoology (<http://www.zoo.cam.ac.uk/>)

### FACULTY OF VETERINARY MEDICINE

- Department of Veterinary Medicine (<http://www.vet.cam.ac.uk/>)

#### Independent Research Centers:

- Wellcome Trust Centre for Stem Cell Research (<http://www.cscr.cam.ac.uk/>)
- Wellcome Trust/Cancer Research UK Gurdon Institute (<http://www.gurdon.cam.ac.uk/>)
- Cambridge Systems Biology Centre (CSBC) (<http://www.sysbiol.cam.ac.uk/>)
- Sainsbury Laboratory (<http://www.slcu.cam.ac.uk/>)

**SCHOOL OF CLINICAL MEDICINE** (<http://www.medschl.cam.ac.uk/>)

**CLINICAL BIOCHEMISTRY** (<http://www.clbc.cam.ac.uk/>)

Metabolic Research Laboratories (<http://www.mrl.ims.cam.ac.uk/>)

**CLINICAL NEUROSCIENCES** (<http://www-neurosciences.medschl.cam.ac.uk/>)

Cambridge Centre for Brain Repair (<http://www.brc.cam.ac.uk/>)

Neurology Unit (<http://www.neurology.cam.ac.uk/>)

Neurosurgery (<http://www.neurosurg.cam.ac.uk/>)

Wolfson Brain Imaging Centre (<http://www.wbic.cam.ac.uk/>)

**MEDICAL GENETICS** (<http://www.cimr.cam.ac.uk/medgen/>)

**MEDICINE** (<http://www.med.cam.ac.uk/>)

Anaesthesia (<http://www.medschl.cam.ac.uk/anaesthetics/>)

Clinical Pharmacology (<http://www.clinpharm.medschl.cam.ac.uk/>). The Master of Philosophy in Translational Medicine and Therapeutics is located within this unit.

Renal Medicine (<http://www.med.cam.ac.uk/divisions-and-research-groups/renal-medicine/>)

**OBSTETRICS & GYNAECOLOGY** (<http://www.obgyn.cam.ac.uk/>)

**ONCOLOGY** (<http://www.oncology.cam.ac.uk/>)

**PAEDIATRICS** (<http://www.medschl.cam.ac.uk/paediatics/>)

**PSYCHIATRY** (<http://www.psychiatry.cam.ac.uk/>)

Brain Mapping Unit (<http://www.bmu.psychiatry.cam.ac.uk/>) Developmental Psychiatry (<http://dev.psychiatry.cam.ac.uk/>)

**PUBLIC HEALTH & PRIMARY CARE** (<http://www.phpc.cam.ac.uk/>)

General Practice & Primary Care Research (<http://www.medschl.cam.ac.uk/gppcru/>)

Clinical Gerontology (<http://www.phpc.cam.ac.uk/gerontology/>)

**RADIOLOGY** (<http://www.medschl.cam.ac.uk/radiology/>)

**SURGERY** (<http://surgery.medschl.cam.ac.uk/>)

Orthopaedic Research Unit (<http://www.orthopaedics.cam.ac.uk/>)

Please note that graduate students in the Faculties of Biological Sciences, Clinical Medicine, and Veterinary Medicine and affiliated partner institutions are considered members of the Graduate School of Life Sciences (<http://www.gradschl.lifesci.cam.ac.uk/>). The Graduate School offers both research degree programs (<http://www.gradschl.lifesci.cam.ac.uk/Prospective/Degrees>) and taught degree programs (<http://www.gradschl.lifesci.cam.ac.uk/Prospective/Taught>), many of which will undoubtedly be of serious interest to applicants for the Churchill Scholarship.

**SCHOOL OF PHYSICAL SCIENCES** (<http://www.physsci.cam.ac.uk/>)

**FACULTY OF EARTH SCIENCES & GEOGRAPHY** (<http://www.esg.cam.ac.uk/>)

Earth Sciences (<http://www.esc.cam.ac.uk/>)

Geography (<http://www.geog.cam.ac.uk/>)

Scott Polar Research Institute (<http://www.spri.cam.ac.uk/>)

**FACULTY OF MATHEMATICS** (<http://www.maths.cam.ac.uk/>)

Applied Mathematics and Theoretical Physics (<http://www.damtp.cam.ac.uk/>)

Pure Mathematics and Mathematical Statistics (<http://www.dpmms.cam.ac.uk/>)

Statistical Laboratory (<http://www.statslab.cam.ac.uk/>)

**FACULTY OF PHYSICS & CHEMISTRY** (<http://www.ast.cam.ac.uk/physchemfaculty/>)

Astronomy (<http://www.ast.cam.ac.uk/>)

Chemistry (<http://www.ch.cam.ac.uk/>)

Materials Science and Metallurgy (<http://www.msm.cam.ac.uk/>)

Physics (<http://www.phy.cam.ac.uk/>)

Scientific Computing (<http://www.csc.cam.ac.uk/academic/MPhil%20SciComp>), a new course administered by the Department of Physics but intended for programs in the School of Physical Sciences, Technology, and Biological Sciences.

**SCHOOL OF TECHNOLOGY** (<http://www.tech.cam.ac.uk/>)

**FACULTY OF ENGINEERING**

DEPARTMENT OF ENGINEERING (<http://www.eng.cam.ac.uk/>):

Energy, Fluid Mechanics and Turbomachinery

(<http://www.eng.cam.ac.uk/research/academic-divisions/energy-fluid-mechanics-and-turbomachinery-0/>)

Electrical Engineering

(<http://www.eng.cam.ac.uk/research/academic-divisions/electrical-engineering-0>)

Mechanics, Materials and Design

(<http://www.eng.cam.ac.uk/research/academic-divisions/mechanics-materials-and-design-0/>)

Civil Engineering (<http://www.eng.cam.ac.uk/research/academic-divisions/civil-engineering/>)

Manufacturing and Management

(<http://www.eng.cam.ac.uk/research/academic-divisions/manufacturing-and-management/>)

Information Engineering

(<http://www.eng.cam.ac.uk/research/academic-divisions/information-engineering/>)

**FACULTY OF COMPUTER SCIENCE & TECHNOLOGY**

(<http://www.cl.cam.ac.uk/local/committees/facultyboard/>)

Computer Laboratory (<http://www.cl.cam.ac.uk/research/>)

As detailed as the above list might seem, because of the richness of the offerings at the University of Cambridge and because of the different organization of the disciplines that is not obvious to an American student, the list does not at all resolve what might appear to be an obvious question: where should you study at Cambridge?

For example, if you are majoring in Physics or in Physics and Astronomy, you are faced first with deciding between a research MPhil in the Department of Physics or the Department of Astronomy and the taught MAST in Applied Mathematics and Theoretical Physics, that is, with deciding between an experimental program and a mathematical program. The decision, however, is not simply between experiment and theory, because in the past Churchill Scholars have done one thing at Cambridge and a very different thing in their doctoral programs in the United States afterwards. The decision an applicant must face is to determine which area of study adds value to his or her background to continue afterwards in one's chosen specialization. The Department of Physics at Cambridge has some fifteen research groups, some of them theoretical in orientation, as well as other programs. The Department of Applied Mathematics and Theoretical Physics includes what one might find in an American Department of Applied Mathematics but also includes areas that one would expect to find in an American Department of Physics and Astronomy (e.g., cosmology, dynamics of astrophysical discs, general relativity, and quantum computation), as well as Computational Biology.

A rapidly developing field like Biophysics, which is rarely located in a single department and which is multi-disciplinary in the United States (see, for example, the programs at Chicago, Harvard, MIT, and Stanford), is also dispersed at Cambridge, so an applicant with interests in this field will be obligated to examine the many options. Similarly, applicants with interests in new and evolving fields like Synthetic Biology and Bioengineering will have to look across departments and programs to find appropriate laboratories, sometimes in unexpected places like Plant Sciences or Epidemiology.

Students of Theoretical Mathematics, which is called Pure Mathematics at Cambridge, should explore the abundant offerings in what is traditionally called Part III of the Mathematical Tripos. American applicants should note that Part III is advanced and is best suited to students who have been fortunate enough to pursue courses at the graduate level in the United States.

Please note that some programs at Cambridge might be eligible for support with the Churchill Scholarship but not necessarily competitive, that some programs are not recommended, and that some programs are outright ineligible.

Hybrid programs like the MPhil in Advanced Chemical Engineering, the MPhil in Micro- and Nanotechnology Enterprise, and the MPhil in Public Health are eligible, but the Foundation will find competitive only those applications that emphasize the scientific elements, and not the policy aspects, of those programs. A student in one of these degree programs will be required to do a thesis in scientific research and not in business or policy.

There are relatively new MAST programs in Astrophysics, Physics, and Materials Science and Metallurgy. The Churchill Foundation *strongly* discourages applicants from considering the MAST in Physics, because the research component is too elementary for someone who might win a Churchill Scholarship; instead, that student should choose between the MPhil in Physics and the MAST in Applied Mathematics and Theoretical Physics. There are no issues with the MAST in Astrophysics. At this time the Foundation does not have pertinent information about the new program in Materials Science and Metallurgy.

Please be aware that the Foundation does not accept applications for the MPhil in Bioscience Enterprise, the MPhil in Conservation Leadership, the MPhil in Engineering for Sustainable Development, the MPhil in Environment, Society and Development, or any other policy-focused program.

No single document can do justice to all the issues and respond to all the questions that might arise in choosing a field of study at the University of Cambridge. While the Churchill Foundation has made every effort to provide update information, it is not responsible for lacunae or errors here. After carefully studying the multiple options at the University, feel free to email the Churchill Foundation at [info@winstonchurchillfoundation.org](mailto:info@winstonchurchillfoundation.org), if you have additional questions, and we shall attempt to provide additional guidance.

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