

# '396' Undergraduate Research Project Application Form

Version: 200603

Office for Undergraduate Research in Science  
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## INSTRUCTIONS FOR STUDENTS

- All fields are required, unless indicated otherwise.
- Download and print this form. Complete Section C and sign.
- See "How students can apply" instructions in Section B.
- Your supervisor or department will tell you if you are selected for this project. If so, you will receive a code to register for a '396' course on MINERVA.

## SECTION A: SUPERVISOR INFORMATION

**Name:** Dr. Arnold Kristof  
Dr. Phil Gold  
**Email:** [arnold.kristof@mcgill.ca](mailto:arnold.kristof@mcgill.ca)

**Phone:** 514-934-1934 #35251  
**Website:** \_\_\_\_\_

**Supervisor's Course Number:** PHGY396  
**Dept or Unit:** Physiology

## SECTION B: PROJECT INFORMATION

**Term:** Winter 2007  
**Project start & end dates:** January 3, 2007 – April 2007

**Project title:** mTOR/STAT1 Interactions in Lung Epithelial Cells

**Project description:** By regulating the innate and adaptive immune responses, interferon-gamma (IFN) is required for the efficient clearance of viral and bacterial infections of the lung. As major participants in lung inflammation and repair, lung epithelial cells respond to IFN by synthesizing inflammatory mediators, and undergoing cellular apoptosis. We study the molecular regulation of 'signal transducer and activator of transcription-1' (STAT1), a transcription factor required for IFN responses in lung epithelial cells. Recent studies in our laboratory identified a distinct protein complex containing STAT1 and two kinases: mammalian target of rapamycin (mTOR) and protein kinase C $\delta$  (PKC $\delta$ ). By immunoprecipitation, mTOR was preferentially bound to phosphorylated STAT1 in cytosolic extracts of unstimulated cells, suggesting a scaffolding, stabilization, or transport function for mTOR. We now hypothesize that phosphorylation mimetic mutants of STAT1 will interact with mTOR, and other proteins that mediate mTOR effects on IFN signaling. We designed and purified recombinant phosphomimetic (S727E, Y701E) or phosphorylation-deficient (S727A, Y701Q) point mutants of STAT1 linked to glutathione-S-transferase (GST). GST alone, GST-STAT1, or mutated GST-STAT1 were incubated with cytosolic lung epithelial cell extracts before binding to glutathione sepharose beads, and separation of eluted proteins by SDS-PAGE. By Western blot analysis of proteins already transferred to nitrocellulose membranes, the student will probe for known mTOR, and its known associated proteins. We expect that phosphorylation of STAT1 is required for its interaction with mTOR, and that the S727E (phosphomimetic) mutant preferentially binds mTOR and its associated proteins. We expect to gain a better understanding of the molecular events required for assembly, trafficking, and activity of specific STAT1-containing complexes.

**Prerequisites:** 1 term completed at McGill + CGPA  $\geq$  3.0; or permission of instructor.

**Grading scheme:** 50% final report, 50% lab work

**Other:** \_\_\_\_\_

**Status:** Mark with an x. **This project is...**  
 Open to applicants  
 Already taken; no more positions available this term  
 Taken, but contact me for other possible projects this term

**Ethics, safety, and training:** Which of the following, if any, is involved? Mark with an x.  
 Animal subjects  
 Human subjects  
 Biohazardous substances  
 Radioactive materials  
 Handling chemicals  
 Using lasers

**For undergraduate students, ethics and safety compliance is the supervisor's responsibility.**

**How students can apply:** Contact me by email.

## SECTION C: STUDENT INFORMATION. (1) PRINT LEGIBLY AND SIGN. (2) SEE "HOW STUDENTS CAN APPLY" IN SECTION B.

**Name:** \_\_\_\_\_ **McGill ID:** \_\_\_\_\_

**Email:** \_\_\_\_\_@mail.mcgill.ca **Phone:** \_\_\_\_\_

**Program:** \_\_\_\_\_ (e.g., B.Sc. Maj. Chem. Minor Biology) **Level:** \_\_\_\_\_  
(circle one) U0 / U1 / U2 / U3

I have not applied for another 396 course in this term.  
**Student signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

## SECTION D: APPROVALS. (1) PRINT NAMES & SIGN. (2) NOTIFY OFFICE FOR UNDERGRADUATE RESEARCH IN SCIENCE. (3) GIVE STUDENT CODE TO REGISTER FOR COURSE ON MINERVA.

**Supervisor:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Unit Chair, Director, or designate** - I certify that this project conforms to departmental requirements for 396 courses. \_\_\_\_\_ **Date:** \_\_\_\_\_